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Monthly Message

The Department of Defense has established an Emergency Medical Care Program and directed prompt accomplishment of certain limited objectives. The primary goal of the program is to develop the "in being" military medical resources required for the essential support of the armed forces during the emergency-disaster phase following a thermonuclear attack and post-attack rehabilitation. The policy is to provide medical support required to maintain the greatest number of military personnel on active duty under conditions imposed by major attack: treatment of casualties and post-attack medical care of the surviving military population.

Phase I includes a large carton of 23 items selected by a joint professional staff of the three medical departments; there are sufficient supplies to provide austere self or "buddy" care for 100 people for 72 hours. These are emergency first-aid items designed to furnish care until the casualties can be evacuated or transferred to facilities under physician supervision for maximum recovery in support of the military mission. In this pack are nine distinctly marked boxes of convenient weight and size for one-man carry. To accomplish effectively the objective for which these units are designed, maximum dispersal must be attained and the packs located adjacent to quarters and work sites. The dispersal requires funding, both retail stock fund and appropriated funds. Initial shipment of the complete packs should commence during the current fiscal year.

Plans are in process to ensure that all personnel are not only aware of the program but also familiar with the items and the effective use thereof. Training at the present time is given to all enlisted personnel of the three services and it also is hoped that *all* officers will understand the use of the emergency packs so that they may lead and direct in knowledgeable fashion.

Phase II attack casualty medical care will be given to casualties primarily by nonprofessional medical personnel under professional supervision. This treatment is more extensive than Phase I care as the casualty will be in medical channels. Materiel in support of Phase II will be directed to and stored adjacent to medical units and will be rotated through the utilization of peacetime usage. It is contemplated that part of the Phase II materiel requirement will be filled during the current year.

Phase III, the definitive care; and Phase IV, which consists of determining military medical requirements (manpower, facilities, materiel, and services) obtained from the surviving national economy, are in the planning stages.

Frank B. Berry

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Foreword

The *United States Armed Forces Medical Journal* is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense. The Assistant Secretary of Defense (Health and Medical) and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this *Journal.*

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Assistant Secretary of Defense (Health and Medical).

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UNITED STATES ARMED FORCES
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RADIATION HAZARDS ABOARD A GUIDED MISSILE CRUISER

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CHRISTOPHER C. SHAW, *Captain, MC, USN*

THE presence of high-energy radar apparatus on vessels equipped with guided missiles has added new and pressing problems in preventive medicine aboard ship of direct concern to the medical officer. Recognition and solution of such specific problems requires familiarity with the physical aspects, technics of measurement, and biological effects of microwave (radar) and ionizing (x-ray) radiations. This article is presented as a summary of basic information and practical experience both ashore and afloat to enable the ship's medical officer to understand the problems and to ensure that proper measures are taken to protect his crew against the potential hazards of radiation such as were encountered aboard the U. S. S. *Galveston*.

SHIPBOARD RADIATION PROBLEMS

The U. S. S. *Galveston* is the third ship in the United States Navy armed with guided missiles and the first such light cruiser in the world equipped with the Talos weapons system which directs guided missiles to the target by high-powered radar beams. She was commissioned at this shipyard on 28 May 1958 (fig. 1). In addition to multiple radar transmitters of various power for tactical purposes mounted throughout the length of the superstructure, this ship is unique because she carries two AN/SPG-49 radar fire-control transmitters for offense mounted on the afterpart of the superstructure. Each such radar has two components: (1) an "acquisition" beam to scan the sky and locate the target; and (2) a "tracking" beam to lock on target and track

From the Medical Dispensary, U. S. Naval Shipyard, Philadelphia, Pa.

its evasive flight while the ship's guided missiles are prepared, launched, and directed to intercept and destroy enemy planes. These very high-power radars are the large domes situated above the missile launcher on the fantail of the cruiser, as shown in

Figure 1. Commissioning ceremonies, U. S. S. Galveston, *U. S. Naval Shipyard, Philadelphia, Pa., 28 May 1958. Note two Talos guided missiles in launcher; also, above the missiles, two large radar domes, AN/SPG-49.*

figure 1. Two separate and distinct radiation problems were found to be associated with the operation of this equipment. One has to do with high-power microwave radiation (radar beam), the other with ionizing radiation (x-ray).

MICROWAVE RADIATION

It is well known that in experimental animals, microwave radiation associated with radar beams of high intensity can cause cataract formation, corneal opacity, or testicular degeneration, and in sufficient intensity may be lethal. However, this may not necessarily apply to the human "animal." Nevertheless, on the basis of existing information the level of 0.01 watts/cm² (10 milliwatts per square centimeter of body surface) has been arbitrarily established as the maximum safe level of microwave radiation for human beings for indefinite periods of time.[1] Higher values are considered hazardous.

Accordingly, in an attempt to establish safe distances from the AN/SPG-49 radar antennas under varying conditions of operation, measurements of the radio-frequency field density were made on 14 March 1958 on the *Galveston* using a new portable radio-frequency power-density meter known as a "microline radiometer;" Model 647 is produced as a research instrument by the Sperry Gyroscope Company. The distance at which the intensity of the radar beams under the various possible operating conditions reached 10 milliwatts/cm² was determined, using this radiometer with the results shown in table 1.

TABLE 1. *Distances for 10 mw/cm²*

Condition	Measured result (feet)
One track beam	92
Two track beams	130
One acquisition beam	162
Two acquisition beams	230
All on simultaneously	265*

*Calculated estimate using measured values for various conditions. (Due to a difference of 90° in polarization of the acquisition and track radar beams, it is not possible to measure accurately the intensity of the radio-frequency field of the combination simultaneously.)

These measurements were made in the center of the beam, with all four beams directed at the same point, either individually or simultaneously.

The beam angle of the ray from these radars is approximately plus or minus 1°, and the intensity falls off rapidly as the measuring apparatus is moved away from the center of the beam. Accordingly, no detectable radio-frequency radiation was found on the fantail when both radars were directed at the ship's boresight tower above it.

The area behind the radar lens adjacent to the AN/SPG-49 radar was below any readable value. A maximal value of 5 mw/cm² was found immediately adjacent to the acquisition screen. The entire area about the radar apparatus does not show any radio-frequency power-density in excess of 10 mw/cm² except directly in front of the lens, thus ruling out significant "side-lobe" effect.

During sea trials early in 1958, conducted by the Naval Board of Inspection and Survey before acceptance of a ship as an operating unit of the fleet, additional measurements were made using the microline radiometer. No detectable radio-frequency radiation was encountered on the signal bridge of the ship located on the forward part of the superstructure when the uppermost AN/SPG-49 beam was pointed directly at it with the acquisition and tracking beams both on full. However, the afterpart of the superstructure was found to have levels of microwave radiation in excess of 10 mw/cm² when the uppermost of the two AN/SPG-49 antennas was pointed directly at the measuring area with only the acquisition beam energized. In addition, the entire fantail of the ship was found to have levels of radiation in excess of 10 mw/cm² when the AN/SPG-49 antennas were both energized on acquisition and track and depressed at an angle of approximately -7° to the horizon so that they pointed directly at the deck of the fantail. No radiation was detectable, however, when both AN/SPG-49 antennas were energized on track and acquisition but were pointed at the boresight tower located on the fantail.

It is apparent from these measurements that certain portions of the after section of the *Galveston* are potentially dangerous when the AN/SPG-49 radar transmitters are pointed directly at them. Personnel, therefore, are not allowed in such areas during activation of the equipment. Under normal operating conditions, no general quarters station aboard this ship is exposed to levels of microwave radiation in excess of 10 mw/cm².

While measurements were being taken of the radar beam intensity aboard this cruiser, each investigator wearing copper-mesh goggles to protect the eyes against overabsorption, it was found that neon lamps will light up if held in these radar beams when the intensity is approximately 5 or 6 mw/cm² and thus well within the safety range. Therefore, as a ready means of detecting intense levels of radiation, crew members working in the area of these radar transmitters have installed small neon lamps (series NE-51, standard U. S. Navy stock) inside their caps. Whenever they think the level of radiation may be excessive, they simply take off their caps and look at the bulbs; if they are lit the men immediately remove themselves from the area. Ordinary photographic flashbulbs are even more sensitive to radar beams, and were found to discharge at a level of approximately 1 or 2 mw/

cm². These makeshift detection devices can be quite useful under circumstances where men are occasionally required to enter areas of potentially excessive microwave radiation.

To date there has been no known overexposure of personnel to microwave radiation on the U. S. S. *Galveston,* and none of the men have reported with signs or symptoms which can be ascribed in any way to effects of high frequency radar.

Because the biological effects of microwave radiation[2] have not been described as extensively as those of ionizing radiation (caused by x-rays, alpha and beta particles, gamma rays, neutrons, and cosmic rays), a short résumé of the action of very high frequency radar beams on living tissue is presented.

BIOLOGICAL EFFECTS OF MICROWAVE RADIATION

Microwave radiation is non-ionizing in character. Nonionizing radiation is produced by that portion of the electromagnetic spectrum with a frequency lower than x-rays; *e. g.,* television, radar beams, infrared, visible and ultraviolet light (fig. 2). Radiation in this frequency range exerts its influence on matter by creating heat, by means of a dielectric effect. Atoms and molecules having asymmetric electrical charges undergo rapid rotation in an alternating electrical field. This "dielectric effect" is characteristic of electromagnetic (microwave) radiation which, biologically, apparently results only in the production of heat.

Under normal circumstances heat generated in the deep tissues of the body is transferred by the circulating blood to the skin where it is dissipated into the environment. Equilibrium of the body temperature as a whole is established when the rate of heat dissipation equals the rate of heat production. The temperature at which this occurs is a function not only of the intensity of incident radiation but also of the capacity of the body to dissipate heat. The existing biological condition, therefore, is influenced to some extent by the environmental temperature, relative humidity, and rate of circulation of air.

Certain parts of the body, because of relatively poor vascular supply, are not well equipped locally for the dissipation of heat and, therefore, sustain greater temperature increments than the body as a whole when exposed to microwave radiation. In addition, local collection of fluids, for example, within the lumen of the gut or bladder and the aqueous and vitreous humors, cannot dissipate heat as readily as an equal volume of vascularized tissue. For these reasons the eyes, the gut, and the bladder are especially susceptible to damage from excessive dosage of microwave radiation. The testicles, although well provided for the dissipation of heat, have an exceptionally low threshold to thermal damage, and therefore also are more readily injured by exposure to microwave radiation.

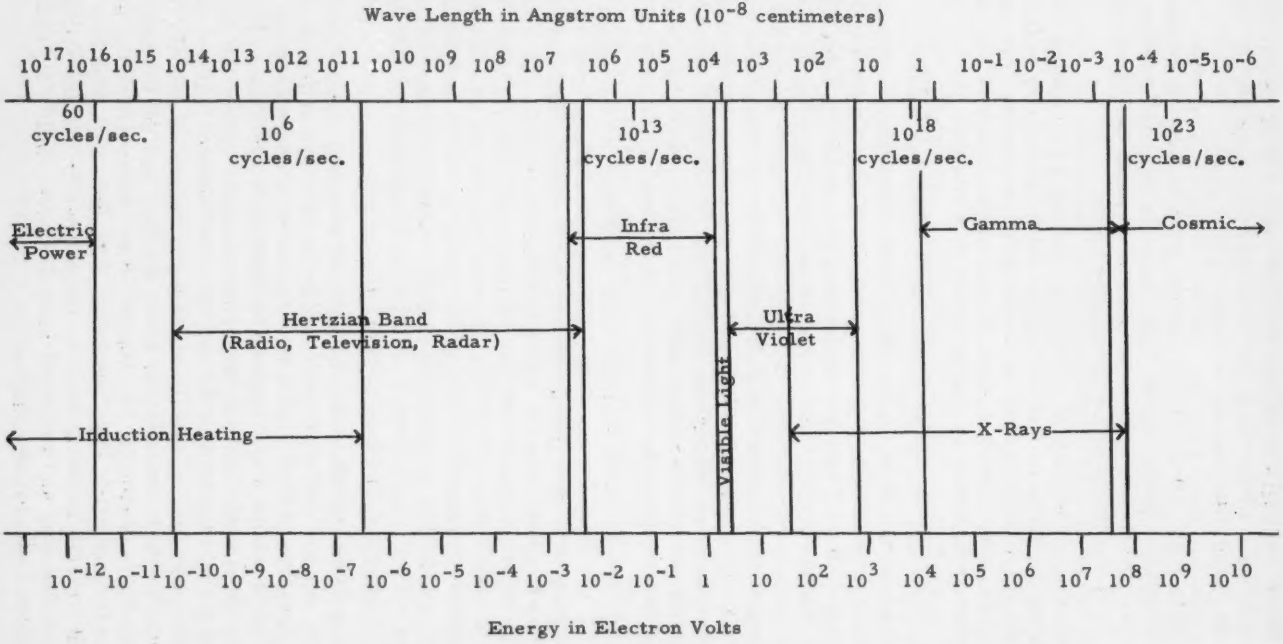
Wave Length in Angstrom Units (10^{-8} centimeters)
10^{17} 10^{16} 10^{15} 10^{14} 10^{13} 10^{12} 10^{11} 10^{10} 10^{9} 10^{8} 10^{7} 10^{6} 10^{5} 10^{4} 10^{3} 10^{2} 10 1 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} 10^{-6}
60 cycles/sec.
10^{6} cycles/sec.
10^{13} cycles/sec.
10^{18} cycles/sec.
10^{23} cycles/sec.
Electric Power
Infra Red
Gamma
Cosmic
Hertzian Band (Radio, Television, Radar)
Ultra Violet
Visible Light
Induction Heating
X-Rays
10^{-12} 10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 1 10 10^{2} 10^{3} 10^{4} 10^{5} 10^{6} 10^{7} 10^{8} 10^{9} 10^{10}
Energy in Electron Volts

Figure 2. The electromagnetic spectrum.

Experimental work with animals[3] shows that cataracts can be produced in rabbits by several minutes of exposure to power densities in the range of 500 to 600 milliwatts/cm². The threshold of experimental ocular injury for a single sustained exposure of 270 minutes was found to fall between 120 and 220 mw/cm². (The frequency used in these experiments was not stated.) In the same and subsequent experiments, the temperature threshold for cataract production at the posterior lens capsule was determined to be 49° to 50° centigrade. It was recommended that these thresholds be considered hazardous for man; that prolonged exposure to microwaves at a power density of 120 milliwatts/cm², or greater, carried the possible risk of cataract formation. It should be noted that these levels are far in excess of that which can be tolerated by the body as a whole. Parenthetically, ultra-high-frequency radiation at an intensity of 60 mw/cm² is not cataractogenic in experimental rabbits because it does not produce heating in the region of the lens.[4]

Figure 2. The electromagnetic spectrum.

The steady state (*i. e.*, indefinite time) threshold for testicular damage in the rat is only 5 to 10 milliwatts of power density. Again, it is estimated that this threshold should pertain to man's genital area.[1]

In a four-year study at the Lockheed Aircraft Corporation, Barron and Baraff[5] compared 226 radar-exposed employees to 88 nonexposed "control" subjects. An extensive system and organ inventory of each person was performed at 6-months, and at 1-year and 2-year intervals, with emphasis on ocular structures, central nervous system, gastrointestinal and urinary tracts, hematapoietic system, and skin. These investigators uncovered no pathologic changes caused by either single or repeated exposures which varied from an occasional incidental contact with the radar beam to as much as four hours' daily close exposure for periods up to four years. Exposures of several minutes a day at distances of less than 10 feet from the radar equipment were not uncommon. Protective clothing was not worn while in or near the radar beams energized in the 400 to 9,000 megacycle range and with occasional peak power output exceeding 1 megawatt.

"The incidence of death and chronic disease, sick leave, and subjective complaints was comparable in both groups. A high percentage of eye pathology was identified, but none with casual relation to the hyperthermia produced by the microwave absorption. Fertility studies revealed essentially the same findings for both groups,"[5] exposed vs. nonexposed employees.

In short, the majority of radars in common use today are relatively low powered and as such do not induce pathologic changes in human beings. In the near future, however, radar beams of much greater power density undoubtedly will become

operational, especially in the military services. This brings into focus the problem of "safe dosage," which in the Armed Forces[6,7] is recommended at not more than 0.01 watt/cm².

A factor of considerable importance in determining safe levels of microwave radiation is the distinction between average and absolute intensity. Most radar apparatus operates on a pulsating rather than continuous output. For example, a specific radar transmitter may use an intermittent signal at a frequency of 1,000 pulses per second, each pulse perhaps only one millionth of a second in duration. In this case the average intensity of the radiation is only one one-thousandth the pulse value. The heating effect of this pulsating radiation is determined by the average rather than the absolute intensity. Fortunately, the usual technics of measurement determine only the average intensity and therefore the results are directly applicable regardless of whether the apparatus operates on a pulsating or a steady state principle.

Be that as it may, our radiation problems aboard the guided missile cruiser did not end with differentiation of the safe from the hazardous areas of microwave emanations from the high frequency radars for intercepting and tracking enemy targets. Another form of radiation, x-ray, was given off by the klystron tubes within the antenna domes of the AN/SPG-49 radars. Radiologic surveys were made by the industrial hygienist (V. H. K.) at the Philadelphia Naval Shipyard before the U. S. S. *Galveston* was commissioned. These surveys revealed intensities of x-radiation at the immediate rear of the traverse member housing the klystron tubes (with the "clamshell" open) as high as 10 roentgens per hour. This is about thirty times the permissible weekly dose for occupational exposure.

Because the presence of these high levels of x-ray were not anticipated, eight men had had duties in this area during intermittent operation of the equipment for several weeks prior to the measurements. Although no record of the time each spent in that area of ionizing radiation is available, it was estimated that several individuals may have received exposure for more than one hour, thus far exceeding the individual permissible weekly dose of 0.3 roentgens. No symptoms of radiation sickness were experienced by any of the men presumably so exposed, and to date (six months later) follow-up ophthalmological examinations have remained negative for cataracts.

When the excessive levels of ionizing radiation were discovered, temporary additional lead shielding of the klystrons was installed at once, reducing the radiation levels well within the recommended permissible dose rates. Eventually, the klystron tubes will be replaced with new tubes provided with built-in shields which will reduce the ionizing radiation to an absolute minimum. Meanwhile, the following safety precautions were recommended:

1. Traverse members (interior of the "clamshell") to be designated controlled areas in which the occupational exposure of personnel to radiation is under the supervision of a radiation safety officer, and appropriately posted under supervision of the ship's radiation safety officer (a Medical Corps officer).

2. Personnel having access to and working in said controlled areas shall be monitored by film badges or pocket dosimeters during their occupancy.

3. Such personnel to receive instruction in safe working practices and periodic physical examinations, in compliance with Bureau of Medicine and Surgery Instructions.

With the precautions listed above, based on scientific measurement of the intensity of the microwave radar beams and x-rays during actual sea trials of the scanning and tracking instruments (AN/SPG-49), no hazard to the health and welfare of the ship's company has been encountered and none is anticipated.

MEASUREMENT OF MICROWAVE RADIATION

The determination of the intensity (power density) of microwave radiation requires special equipment not readily available to ships. Furthermore, an understanding of the technic involved requires a certain degree of familiarity with electronic principles not commonly possessed by medical officers. It therefore would be superfluous to discuss the procedure in this article. For those interested, practical details for the determination of power density at microwave frequencies are outlined in reference.[6]

It is expected that in the not too distant future portable apparatus for measuring microwave radiation will be available for routine use in the power-density determinations aboard the U. S. S. *Galveston*. Meanwhile, neon lights will glow when exposed to microwaves producing approximate energy of 5 or 6 milliwatts per square centimeter. Photographer's flashbulbs will "fire" at 1 or 2 mw/cm^2. As practical safeguards to avoid excessive exposure to radar waves, they are ideal.

SUMMARY

Microwave, nonionizing radiation (radar beams) in sufficient intensity can produce testicular damage, lenticular and corneal opacities in experimental animals, and possibly even death from "cooking" of viscera by excessive diathermy.

Ionizing radiation (x-rays) in sufficient intensity will initiate the "acute radiation syndrome"[9]; low doses over long periods of time are cumulative, increase the incidence of malignancy and possibly may shorten the life span or produce undesirable genetic mutations. A comparison of the major aspects of ionizing (x-ray) and nonionizing (radar) radiation is presented in table 2.

Both types of radiation (ionizing and nonionizing) were encountered aboard the U. S. S. *Galveston* at hazardous levels; some personnel were inadvertently exposed to presumably excessive doses of x-ray prior to commissioning of this vessel, but without ill effect, then or six months later.

TABLE 2. *Comparison of major factors of ionizing (x-ray) and nonionizing (radar) radiation*

Factor	X-ray (ionizing radiation)	Radar (nonionizing radiation)
Etiologic agent	Alpha particles Beta particles Neutrons X-rays Gamma rays Cosmic rays	Microwaves (radar) Radio and television Infrared Visible light Ultraviolet
Unit	Roentgen Roentgen-equivalent-man (rem)	Watts per square centimeter
Mechanism	Ion-pairs	Dielectric effect = Dipolar alternation = Molecular motion, heat
Clinical	In man: Acute radiation syndrome Prodromal Cerebral Gastrointestinal Hematopoietic Cumulative effect Genetic damage Shortening of life span (?) Leukemia Carcinogenesis	In animals: Cataracts Testicular damage Hyperthermia Necrosis of gut Hyperpyrexia Death
Monitors	Geiger counter Film badge Pocket dosimeter	Microline radiometer Neon lamp Photographic flashbulb
"Safe" dosage	0.05 rem/day or 0.300 rem/wk but not over 5.000 rem/yr	.01 watt/cm^2—may be continuous (10 milliwatts per square cm) No time limit

Temporary measures have been taken with complete success to protect the crew from both types of radiation, and other more effective measures are proposed for the future. Small neon lamps (series NE-51, USN) will glow at 5 to 6 mw/cm^2 and photographer's flashbulbs will "detonate" at 1 to 2 mw/cm^2 of power density. Thus, they are excellent practical safeguards to prevent overdosage of personnel.

The seriousness and irreversibility of overabsorption of both types of radiation, and the usual absence of symptoms at the time of exposure, warrant the most careful precautions and safeguards to give the crew adequate protection from these potential hazards. In the last analysis such matters are problems of public health and preventive medicine and are of vital importance to military as well as civilian personnel. This entire area is a prime responsibility of the medical officer, both ashore and afloat.

ACKNOWLEDGMENT: The authors are indebted to Mr. Frank Fecher, ordnance engineer, U. S. Naval Shipyard, Philadelphia, Pa., for technical assistance in preparation of the electronic aspects of this report.

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HEALTHY PARTNERSHIP

I believe the goal of a healthy citizenry is a challenge to all of us in the health profession, both in and out of government. It is a challenge that calls for concerted and cooperative action by all groups that have a stake in better health. We in government would like to be a helpful partner in this vast enterprise. The results of the years of partnership between the government, the people, and the medical profession are evident in every phase of national health. We need only to move forward together to achieve even better health care for the people of this country.—Aims C. McGuinness: The Role of the Federal Government as it Relates to Medicine. *Southern Medical Journal,* December 1958.

ACUTE PSYCHOTIC REACTIONS OCCURRING DURING TRAVEL

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DASIL C. SMITH, *Lieutenant Colonel, USAF (MC)*

IN the past few years a series of patients who developed transient psychotic episodes while traveling were observed at this hospital. Because of certain common clinical features, we have referred to the condition as the *travel syndrome.* In these cases the psychotic episode is of short duration, lasting a few days to two weeks or so and remission is usually complete. Of the various psychotic symptoms, the most characteristic are paranoid delusions and hallucinations. In many cases, alcohol was an important causal factor.

TRAVEL SYNDROME

In a typical case the symptoms appear after the individual has been traveling several days, often to or from an overseas assignment. Before his departure he may have drunk more alcohol than usual at one or more going-away parties. During the trip, as a rule, he drinks no further alcohol but eats irregularly and inadequately with minimal fluid intake. Insomnia is common so that fatigue is an added physiologic factor. He has no familiar companions and little break in the monotony of traveling. The psychotic symptoms appear after two or three days of travel, sometimes insidiously but more often explosively. The individual's fear and panic or his pleas for protection from some delusionary threat result in his hospitalization, often through the hands of the police.

Psychologic stresses associated with the trip also contribute to the development of the illness. The individual who is traveling to an overseas assignment faces the prospect of new responsibilities while separated from friends and family for a long period. The one returning from such an assignment is often concerned with re-establishing family relationships, some of them previously disturbed and painful. For example, one of the few patients not traveling alone was bringing his Japanese bride home to meet his parents who had opposed the marriage.

From U. S. Air Force Hospital, Parks Air Force Base, Calif. Dr. Flinn is now at U. S. Air Force School of Aviation Medicine, Randolph Air Force Base, Texas.

A very few similar cases have been reported. Some years ago, comparable cases were observed at Letterman Army Hospital.[1,2] The syndrome usually occurred in soldiers who had traveled several days by train. Fatigue, alcoholic intake, and inadequate nutrition were often present, as in our cases, and the psychotic episode was of brief duration after these factors were corrected. Another interesting and somewhat similar series of cases of acute psychotic reactions in military personnel during World War II were observed by Fox[3] who described four cases. In each instance the man had come from an isolated Pacific duty station to a large city for a much anticipated furlough. Upon arrival the man took a hotel room, began drinking, and indulged in sexual promiscuity. In one to three weeks each patient became acutely psychotic. Their hallucinations and delusions were frightening and had a prominent erotic or homosexual component. These patients with "furlough psychosis," as Fox termed it, responded promptly and fully to hospitalization and within three weeks each was asymptomatic. In parallel cases in Naval personnel the importance of emotional factors associated with transfer was observed by a psychiatrist.[4] In what he called the "chief syndrome" a transient psychotic reaction developed during an individual's transfer to another post. The syndrome often was seen in a chief petty officer who had attained his rank through wartime exigency but whose qualifications were otherwise marginal. Often in his previous billet he had been carried along by associates. Transfer raised the disturbing prospect of struggling with a new job among strangers. Such men, although usually not excessive drinkers, would drink heavily before the transfer. During the trip an acute psychotic illness would develop just as in our cases of travel syndrome.

Over a three-year period, 22 cases of so-called travel syndrome were seen. Such a small series hardly warrants a detailed tabulation but a general summary of the clinical manifestations can be made. All of the 22 patients exhibited such overt psychotic symptoms as hallucinations, delusions or ideas of reference. Thought content was not stereotyped but was colored by the patient's individual conflicts. Clinical evidence of dehydration and fatigue were present in varying degree in nearly all patients, but routine somatic studies were otherwise normal. Most of the patients had a clear sensorium. Seven of the patients were heavy habitual drinkers and could probably be classified as chronic alcoholics. Of this group, five showed disorientation, confusion, tremor and fever consistent with delirium tremens. Even in these, however, the hallucinations were more prominently auditory than visual and the delusional ideas were fairly well organized and coherent. Eleven of the patients were moderate to heavy, regular drinkers, although they could not be considered chronic alcoholics. In the remaining four, there was no history of alcoholic intake. All but these four had a history of drinking just before starting to travel, although the amount varied widely.

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Treatment consisted of such measures as correction of fluid deficiencies, sedation, insurance of adequate nutrition and vitamin supplements. Approximately one-fourth of the patients received small doses of chlorpromazine hydrochloride. Most patients were entirely asymptomatic within one week. In the four with no history of alcoholic intake, recovery was not as prompt or as complete. In these, while the overt psychotic symptoms disappeared within three weeks, two had only partial insight into the delusional nature of their experiences.

CASE REPORTS

Case 1. A 36-year-old officer was admitted to the hospital after complaining to the police that "an OSI colonel" was plotting to kill him. The patient had just returned by air to the United States from a tour of duty in the Far East. In the two days prior to departure he attended a going-away party, drank heavily, and had a brief extramarital encounter, something he had not done before. A few hours after departure he began to feel that other passengers were talking about him. Soon he heard them making disparaging remarks about his recent behavior and plotting to do him bodily harm. In Hawaii he believed that official statements regarding his conduct were gathered from passengers. By the time he reached California he was very frightened and in a railway station thought he heard two sailors plotting to kill him. He forced his way into the baggage room and called the police, who surveyed the situation and then left. When he again summoned the police to complain about the OSI colonel who he believed was going to kill him, he was brought to the hospital.

On admission he was markedly agitated. He thought that his wife was somewhere in the hospital, and expressed a great deal of guilt about his recent behavior. One of his many paranoid ideas concerned the arrest of "10,000 people in San Francisco alone" because they wanted to kill him. He was fully oriented in all spheres and there was no evidence of recent drinking. During 10 days on a closed ward he received moderate doses of chlorpromazine hydrochloride. He easily gave up the delusion that his wife was in the hospital after he was allowed to call and talk to her in another state. In the first few days his apprehension diminished and the hallucinations and delusions disappeared. He was completely asymptomatic at the end of 10 days, and was returned to duty after a one-month hospitalization.

According to the patient's past history, he had done better than average work in college, and had flown 55 missions during World War II without incident. Since that time he had effectively performed his administrative duties, and his service record was excellent. In the past he had used alcohol regularly, but not to a degree that caused occupational impairment or marital discord. He had drunk only infrequently for the last six months of his overseas tour, until the time of the going-away parties.

Case 2. A 38-year-old divorced airman first class was returning by bus to the west coast after a two-week leave at his home in Boston.

In Wyoming, on the third day of the trip, he began to "make up words to the hum of the tires." Soon it seemed as if they actually were saying "you gotta go back, you gotta go back" and next he was convinced his father was speaking to him. As the journey continued he thought that carloads of people from his home city were chasing the bus to return him to Boston. At the next bus stop the patient accosted several people whom he thought were former friends and neighbors. He was then apprehended by the police and hospitalized at a nearby military hospital. Records from the hospital indicate that he was confused on admission and had hallucinations and delusions. These symptoms cleared rapidly and upon his transfer to this hospital five days later he showed no evidence of disordered thinking. He could remember the details of his experience and had good insight.

His past history showed a pattern of long-standing passivity and compliance. He had married at 25, and nine years later had agreed without complaint when his wife refused to join him overseas and asked for a divorce. He spoke of her fondly and expressed no resentment about her reported liaison with a man whom she married immediately after the divorce. He was always close to his mother and had been affected deeply by her death two years before his illness. During his service career he worked as a parachute rigger and had been steady and dependable. Prior to his marriage he was a heavy drinker; thereafter he drank only beer but consumed this regularly, usually becoming drunk on weekends. He had never missed work or received disciplinary action because of drinking, and had advanced at an average rate considering several prolonged breaks in service.

During the leave that preceded his illness, the patient helped his father with some carpentry work at home. He drank little until the last three days of his stay when he moved to a hotel because he felt his sister-in-law resented his presence. He felt guilty about leaving his father to work alone. He drank heavily with friends and relatives for the next three days and had a hangover when he boarded the bus. He did not drink during the trip but he ate little because he was running out of money. He continued to feel guilty about having failed to help more at home and this theme was prominent in his psychotic symptoms. During his hospitalization he received no specific somatic therapy. He was returned to duty three weeks after the onset of his illness.

These two cases are typical of the travel syndrome. Each individual drank heavily before starting to travel and in each, emotional stresses were present which influenced the psychotic symptoms. In the following case, there was no history of alcohol intake, but there was evidence of a pre-existing emotional disorder. Recovery was neither so prompt nor so complete as in the cases above.

Case 3. A 22-year-old married Negro airman became psychotic while traveling to his home in the South after a tour of duty in the Far East. While on a train in the Midwest, he developed the idea that his fellow passengers were talking about him. He began to hear voices accusing him of making improper advances to a girl on the train, and he was

afraid his life was in danger. He was removed from the train in a markedly apprehensive and delusional condition.

He was transferred to this hospital, arriving five days after the onset of his symptoms. On admission he no longer had hallucinations but gave a dreamlike account of his delusional experiences, with no insight. He told of having been abducted by the father of the girl he was supposed to have insulted, of being taken on an airplane trip during which he was threatened with a gun, and finally of surviving a crash and escaping with the help of the sheriff. His memory of being handed over to the air police and of his initial hospitalization and transfer were undistorted. During a three-month hospitalization he showed no further overt psychotic symptoms, but he continued to believe in the reality of his delusional and hallucinatory experience. His quiet, seclusive ward behavior, withdrawal from interpersonal contacts and affectual blunting indicated a schizophrenic reaction, a diagnosis supported by psychologic evaluation. He was medically discharged from the Air Force.

The patient in the following report has some features of pathologic intoxication that suggests a relationship between this alcoholic psychosis and schizophrenia. This patient, like one other in the series, had two separate episodes of travel syndrome.

Case 4. This 29-year-old divorced airman first class, enroute overseas, was noted at the port of embarkation to be hyperactive and confused. He was referred to a hospital where he was found to be disoriented, tangential and grandiose, with flight of ideas and increased psychomotor activity. Despite high doses of chlorpromazine hydrochloride, he was impulsive and assaultive for the next few days. Upon the patient's arrival at this hospital about a week after the onset of his illness, these psychotic symptoms had subsided. He remembered and gave a coherent account of his experiences before and during the initial hospitalization, projecting the blame for his resistive and belligerent behavior upon the hospital personnel. He told of drinking heavily for several days in anticipation of his overseas transfer.

The history of a similar episode a year or so earlier was available. On that occasion, while enroute from overseas duty in Korea to a new station, he had been drinking and arguing with buddies on the train, and as he put it, felt "mad at the world." He got off the train to buy a few items and, while in the station, became violently excited and destructive. He was quickly apprehended by civilian authorities and hospitalized. For the next five days he was excited, his thinking was disorganized, he had auditory and visual hallucinations, and he was hyperactive and euphoric. After improving on large doses of Thorazine (brand of chlorpromazine hydrochloride) he relapsed in a few days and again became hyperactive, with bizarre and autistic behavior, visual hallucinations and extreme excitement. Remission occurred after a series of six electroconvulsive treatments, with only some remnants of his euphoria remaining.

The patient had been raised by foster parents who doled out a great deal of "old-fashioned discipline." In the past he had usually repressed feelings of anger and resentment but periodically he would express them in explosive outbursts. This pattern had resulted in a stormy adolescence, a short-lived marriage and frequent changes in civilian jobs. On military duty he had managed to control his feelings for the most part and had received no disciplinary action. There was no evidence of excessive drinking or unusual reaction to alcohol except for the two episodes of travel syndrome. He was separated medically with a diagnosis of schizophrenic reaction.

DISCUSSION

Almost 50 years ago Bleuler[5] commented on the relationship of schizophrenia to the various alcoholic psychoses. He observed that the symptoms of schizophrenia in those who drank during acute attacks frequently had an alcoholic coloring. In these patients the multiple, moving visual and tactile hallucinations of delirium tremens might be present, or the voices might be of the threatening type in which the person is addressed in the third person as in alcoholic hallucinosis. Bleuler concluded that schizophrenia predisposes the patient to delirium tremens, noting that only in schizophrenics does delirium tremens appear in patients below the age of 25 after merely a few years of alcoholism.

The small series reported here illustrates the manner in which psychologic and physiologic factors may combine to produce a transient psychotic condition. The cases may be considered along a range between two extremes. At one end are the five cases resembling delirium tremens. In these the importance of the physiologic component is indicated by the nature of the mental disorganization. In these, the psychotic episode, while taking on some features of the patient's underlying personality, was characterized primarily by evidence of intellectual impairment. Clouding of consciousness, disorientation, distractibility and partial amnesia were prominent and often such concomitant physiologic alterations as tremor, dehydration and fever appeared.

At the other extreme were the four patients with no history of alcoholic intake. Case 3 illustrates this group. In these there was evidence of a significant pre-existing emotional disorder. The psychologic stress of travel seemed capable of precipitating a latent psychotic reaction in this group. Recent investigations concerning sensory deprivation are of interest in this connection. Such experiments have shown that individuals who are isolated and deprived of sensory stimulation may develop bizarre imagery, fantasies, and in some cases actual hallucinations.[6,7] Under these conditions the ability of the subject to distinguish reality from fantasy may be temporarily suspended. Transient psychotic reactions related to restriction or alteration of sensory stimuli have been recognized clinically. They have been reported in postoperative cataract patients who have both eyes bandaged,[8]

in poliomyelitic patients being treated in a tank type respirator and in certain other medical and surgical conditions reviewed by Leiderman and associates.[10] While men traveling are not "isolated" in the ordinary sense of the word, a trip of several days' duration among strangers, with unaccustomed surroundings, inactivity, monotony and absence of the usual social relationships, may promote fantasy in a similar manner and help precipitate a psychotic reaction in an otherwise predisposed individual.

Between these two extremes were 13 cases in which physiologic stress and some degree of emotional stress and predisposition seemed to combine to produce the psychotic reaction. This group is illustrated by cases 1 and 2. In this middle group premorbid personality trends were often clearly reflected in the psychotic symptoms. The most conspicuous symptoms were hallucinations, usually of a threatening nature, and delusions and ideas of reference soon developed to support the verbal threats. There was a close resemblance to so-called alcoholic hallucinosis, although only one patient had the overtly homosexual component to the threats so commonly seen in this condition. More common in our cases were threats of bodily harm, or accusations as to various crimes, communist activities, security violations or heterosexual activity. In these cases one may speculate that the occurrence of the psychotic reaction was dependent upon the presence of both factors, and might have been avoided had either the emotional predisposition or the physiologic alteration been less marked. Assessing the relative importance of such factors, however, remains uncertain. Alcoholic hallucinosis, for example, is believed by many to represent an underlying schizophrenia.[11] Experience does show that many who have such episodes later develop a clear-cut schizophrenia. Our present limited understanding of this complex relationship is well exemplified by the comment of a very experienced psychiatrist, who remarked only half in jest, "If they get well in two weeks, it's alcoholic hallucinosis; if they don't, it's schizophrenia."

SUMMARY

A series of cases concerning 22 patients suffering from an acute, transitory psychosis has been presented and discussed as the travel syndrome. Typically, these patients had consumed more alcohol than usual prior to a long trip marked by fatigue, irregular eating, and emotional stresses. The psychotic reaction occurred after several days of travel. The most prominent symptoms were apprehension, hallucinations, ideas of reference and systematized paranoid delusions. Symptoms quickly subsided following the patient's hospitalization, prognosis was good, and most patients could be returned to duty in a relatively short time. The syndrome is seen most frequently near large ports of embarkation.

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NINTH MOST FREQUENT CAUSE OF DEATH

At least one person takes his own life every half hour around the clock in the United States. The figure of 16,000 deaths by suicide registered in 1956 is probably conservative, since many suicides are concealed or passed off as natural deaths or accidental deaths. Even so, suicide ranks ninth as cause of death in the United States. The concerted campaigns against diseases which are major causes of death undoubtedly will result in suicide becoming more prominent in the list. The advent of the medical examiner system, which is conducive of a thorough investigation of violent deaths, will add to the number of cases of suicide that are reported annually. Finally, the fact that suicide is relatively more common in old age will cause an increased suicide rate as the age of the population increases. As yet there is no organized public interest in suicide and no wide campaigns have been waged against it. Prevention of suicide appears more feasible with more immediate benefits than prevention of many of the diseases that are being attacked by popular demand.—Robert Hausman: Investigation of Suicide. *Texas State Journal of Medicine,* January 1959.

SPINAL CORD INJURIES IN WORLD WAR II

I. Examination and Operative Technic in 201 Patients

WOLFGANG W. KLEMPERER, *M. D.*

SPINAL CORD injuries, comprising the smallest group of war wounds (about 1 per cent), presented some of the most challenging problems in World War II. They will continue to do so, because paraplegic patients are in need of medical care or supervision as long as they live. It is not the purpose of this article to cover every aspect of this problem as a manual would.[1] It is rather my desire to use the data, experiences, and lessons learned in World War II and pass them on to a new group of neurosurgeons who are confronted with the treatment of similar injuries.

During World War II the neurosurgeons of the Second Auxiliary Surgical Group treated 201 patients with spinal cord injuries sustained during the North African and European campaigns. Of these patients, 188 were wounded in action and 13 met with accidents. Of the 191 injuries sustained by Army personnel, the infantrymen accounted for 148; the Navy, 1; Air Corps, 2; and civilians, 7. The majority of these men (153) were in the 21-30 year age group, 28 of them were under 21 years, and 18 were in the 31-40 year age group. This report includes 41 cases reported earlier.[2] Significantly enough, the lessons learned and the methods recommended and adopted had by then proved themselves enough to remain essentially unchanged in this present larger group.

As in all war wounds, spinal cord injuries present different problems in the various stages of the patients' evacuation. The first-aid man, who establishes the initial contact with the wounded, is concerned with external wound care (no different from any other injury), relief of pain, and transportation of the wounded to the first medical installation. For relief of pain, morphine is contraindicated in cervical or high thoracic injuries, because of usually present respiratory difficulties. Therefore, less depressant drugs are preferable, none specifically to be singled out. Except for the occasional nerve root injury, pain is not a very important problem at that time. Transportation, however, may well be. In a survey of civilian spinal cord injuries[3] the

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authors required the presence "of not less than six men" to pick up the casualty. By contrast, in battlefield situations two available corpsmen are usually content to carry their patient into the nearest battalion aid-station. Discussion centers frequently on the best carrying position for the patient, whether on abdomen or back, with spine straight or extended. Obviously the corpsmen have neither the time nor the training to determine the extent of the injury which might well be the determining factor. In general, a neutral position, with immobilization of the head, in case of a cervical injury, is desirable, care being taken to neither flex nor extend the spine on transfer from ground to stretcher. How difficult the initial transportation can be is illustrated by case 181 of the series of 201 cases studied:

> 9/13/43, incomplete, shell fragment, spinal cord injury at thoracic 12 level (Th_{12}), found by German patrol
>
> 9/13/43 to 9/16/43, in German first-aid station, local dressings, shock therapy
>
> 9/16/43, Americans advance, Germans retreat, leaving patient with Italian civilians, lying on straw
>
> 9/20/43, found by American patrol, brought to 16th evacuation hospital

At the battalion aid-station the patient is treated for shock, which is often present in cervical and high thoracic spinal cord injuries but is less common in cord injuries at lower levels. If his condition permits, the patient is sent as rapidly as possible to an evacuation hospital. There a neurosurgical team can give the first adequate care to the injured spinal cord, and there most cases (144 patients) of this group were treated. The evacuation hospital is a mobile tent installation of approximately 150 to 300 beds, located 5 to 50 miles behind the front lines. Attempts to do neurosurgery in the smaller, more mobile field hospital close to the front failed, not so much because of lack of available operating facilities, but because the greater mobility of this type of hospital did not allow undisturbed postoperative care in the first critical postoperative week.

It is important to realize that the initial procedure at the evacuation hospital represents in most cases the only operation on the spinal cord. All later operative efforts usually fail to improve the patient's neurological status. Dissecting and freeing of scars or adhesions, results of the original trauma or the first operation, from still functioning spinal cord tissue, is often impossible without further damage to the spinal cord. Neurosurgeons, therefore, must be conscious of their responsibility to exert their best judgment and skill in the initial debridement, laminectomy or decompression, all of which amounts frequently to the definitive and final therapeutic effort. The neurosurgeon at the evacuation hospital is also responsible for the early post-

operative care of about 7 to 10 days' duration. By this time the patient usually is convalescing successfully after the operation and has coped with the often present complications, such as wounds of the chest or abdomen, so that he can be evacuated safely to a station or general hospital 50 or more miles behind the front lines. In a few cases, purposely delayed for definitive care, successful restorative neurosurgery in lesions of the cauda equina were carried out in these larger installations or even in general hospitals in the continental United States.[4] The time of transfer to the latter depended more on administrative dispositions, shipping or air evacuation facilities than on medical reasons. This chain of evacuation and these time intervals represent ideal conditions that are not always possible. To prevent infection and to give earliest care to the spinal cord injury, it is necessary to shorten the time interval between wounding and operation. This time interval (table 1) lies ideally between

TABLE 1. *Time intervals from injury to operation in different medical installations*

Time intervals (in hours or days)	Number of patients at each type of hospital					Total
	Field	Evacuation	Station	General	Civilian	
(hours)						
6	1	7				8
12	1	19		1		21
18		20				20
24	1	31		1		33
36		32	1		1	34
48		8		3		11
72		6	2	1		9
(days)						
4		6	2	3		11
5		3		4		7
7		1				1
10				2		2
20		1	1	9		11
30				4		4
40				4		4
50				2		2
60				2	1	3
80				1		1

12 and 36 hours. However, it was not always possible to institute treatment by that time. The reasons for delaying operation are administrative or strategic in 50 per cent of the cases (table 2).

DIAGNOSIS AND EXAMINATION

The diagnosis of a spinal cord lesion should offer no difficulty. Under ordinary circumstances the location of the wound of entrance alone, the direction of the wound tract, together with roentgenographic findings, will point to the spinal column

as site of the injury. The additional defects in motor power, sensorium, reflex changes, history of an inability to void, or a palpably distended bladder will leave no doubt as to the additional involvement of the spinal cord. At times, however, extensive wounds of chest or abdomen will obscure the correct diagnosis of a spinal cord injury by diverting the attention of

TABLE 2. *Length of time and reasons for delay of operation beyond 36 hours in 52 cases*

Days to operation	Administrative or strategic				Severe associated injuries of						Neuro-logical		Infected wound of entry or infection at site of proposed laminectomy	Total cases
	North Africa	Sicily	Italy	France	Perforated chest	Perforated abdomen	Lacerated kidney	Perforated chest and abdomen	Perforated chest and abdomen, lacerated kidney	CNS damage (low temperatures)	Late diagnosis in spinal management block	Increase in neurological signs		
2					1									1
3	1	1	2	1			1	1						7
4	2	3		3	1	1			1	1		1		13
5		2	1					2						5
6										1				1
7														
8	1													1
9	1													1
10-19														
20-39		2	1		2					1	1			7
40-59	1				1	1		3				1	1	8
60-79			2					1		2			1	6
80-99	1													1
100												1		1

the military medical personnel to the more obvious injury. An extremity wound will be thought of as probably involving a peripheral nerve with resulting motor disability, whereas actually a small and insignificant looking wound tract somewhere else leads to a traumatized spinal cord and the correct diagnosis. Coma and shock might also be responsible for delaying recognition of a cord lesion. As soon as diagnosis of the spinal cord injury has been established, data on the following six points should be noted on the case record: (1) location, size and appearance of the wound of entrance and exit (if present); (2) motor status; (3) sensorium; (4) reflexes; (5) bladder function; and (6) bedsores. An accurate and complete record is absolutely necessary to the proper handling of such a casualty.

The wound. The majority of wounds are penetrating wounds located in the back, fairly close to the midline, with concentrations around the cervicothoracic junction (fig. 1). Very few are found on the anterior aspect of the body. The surgeon should inspect the wound pre-operatively to estimate the likelihood of associated visceral or vascular injuries possibly in greater need

of therapy than the spinal cord injury, to order the most desirable roentgenographic view and, finally, to plan his operative attack. Cleaning or superficial debridement of the wound should be done at the time of definitive surgery, unless purposeful delay of operation is necessary. It is impossible to state how long a wound can be left unattended without becoming infected.

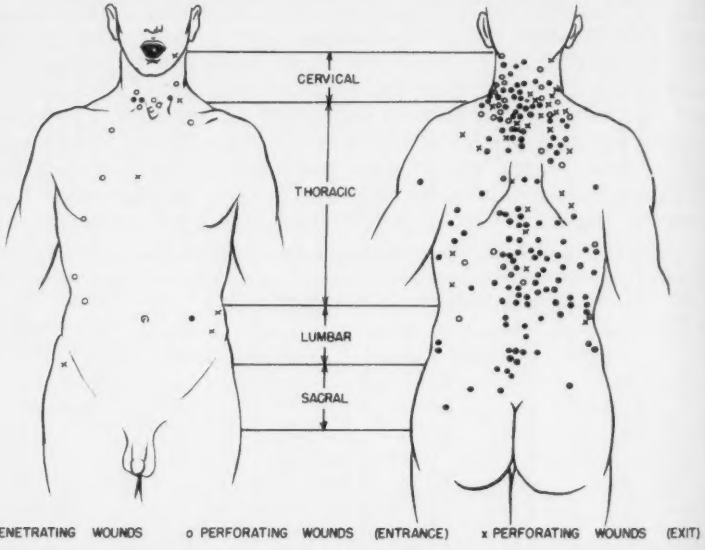

Figure 1. Location of penetrating and perforating wounds causing injury to spinal cord.

Probably 48 to 72 hours is the duration of this "grace period." During the inspection of the external wound a cerebrospinal fluid leakage will be found occasionally. In this group it was present in 10 cases (3 cervical, 6 thoracic and 1 lumbar). It usually indicates a short wound tract made by a fairly large-sized foreign body (fig. 2). Pre-operative presence of a cerebrospinal fluid leakage does not mean that it will be present after the operation. Interestingly enough, postoperative leaks occurred in five different cases (2 dorsal and 3 lumbar). Again responsible were large foreign bodies causing considerable loss of dura (making dural closure difficult) and widely debrided wound tracts, purposely left open. In time the wound tracts closed in and healed without complications in all these cases.

Motor and sensory status. Findings of motor and sensory examination should be accurately recorded. Even negative findings are important since the personnel handling the case may change and decisions, for instance, on whether or not to operate are based upon an accurate record. There were no remarkable find-

ings in reference to muscle power examination, except in one incomplete cervical 3 (C_3) spinal cord injury in which weakness of hands could be produced on forward neck flexion, together with paresthesia in hands and lower arms, both probably due to temporary nerve root pressure. Detailed differentiation of the various sensory modalities is usually not necessary nor contributory. Pain, touch and pressure perception are sufficient to establish an accurate neurological level of injury. Preferably those levels should be described in terms of dermatomes. If that is impossible a record of gross anatomic landmarks referring to

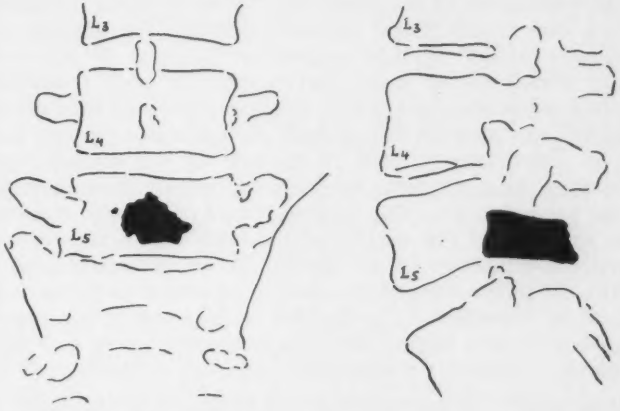

Figure 2. Ink tracing of roentgenogram of lumbosacral spine in complete spinal cord injury at L_3. Foreign body is in solid black.

the sensory level are better guides than complete omission of sensory findings. Sensory levels and defects are usually a far more delicate yardstick, not only of the level of injury, but also of the extent of the spinal cord damage. In four complete spinal cord injuries, sensation of testicular pressure was retained; these lesions occurred between levels of Th_2-Th_{10}. One other case initially gave every appearance of a complete lesion with total loss of motor power and sensory modalities below Th_{12} and he too had retained the perception of testicular pressure. This lesion later had to be called incomplete since in the postoperative course a minimal amount of deep pressure sensation in his legs was recovered. Whether or not, in the complete thoracic lesions, testicular sensation is conducted by an intact sympathetic chain is an unanswered question. However, it should be remembered that the preservation of the testicular sensation in a complete spinal cord lesion is possible and has no prognostic value.

Sensory examinations are sometimes difficult to interpret if the foreign body passes via the brachial or lumbosacral plexus into the region of the cord, causing a mixed plexus and cord sensory loss. This occurred in three cases with injuries due to a single shell fragment. There is one case of an incomplete Th_1 spinal cord injury that presented simultaneously a separate lumbosacral plexus injury causing unilateral foot drop. Occasionally, sympathetic changes were noted, such as unilateral Horner's syndrome in spinal cord injuries at C_4-C_7 levels and a striking difference in the temperature of lower extremities, one leg being warm and the other cold. This latter finding was noted in two cases of Th_{10} and Th_{11} injury with the foreign body lying in the spinal canal without evidence of damage to the sympathetic chain. In this connection a group of six cervical and high dorsal spinal cord injuries with low body temperatures, low blood pressures, pulse and respirations is of interest (table 3). Inability to prevent fall of body temperatures, in one case to 82°F, is noteworthy in view of the low air temperatures at time of wounding. In each case the casualty remained exposed to the cold for several hours. Due to disturbed sympathetic mechanisms of the spinal cord the control of the body temperature was lost. A final hyperthermia up to 106°F, 24 to 48 hours later, on a cerebral basis superseded the earlier failure at a lower neuronal level. It is important to note that in four out of six cases the foreign body was a bullet. Because of greater speed and penetrating power, greater damage was caused, extending to higher cervical levels. The prominence of bullet wounds in this group is in considerable contrast to the over-all ratio of 2:1 in favor of shell fragments (table 4). In all these cases the blood pressure remained low for several days in spite of repeated transfusions and absence or control of associated injuries. Either at operation or autopsy the complete gross or histologic destruction of the spinal cord at high cervical levels was noted. Priapism was noted in only eight cases at the time of the initial examination. All these were complete lesions at levels from C_6-Th_4.

Reflexes. No new observations can be added in regard to reflex examination. With very rare exceptions, in which a slow plantar response simulating a normal finding was obtained, the initial suppression of all deep and superficial reflexes in the early phase gave way to the typical hyperactivity and plantar extensors in complete spinal cord injuries.

Bladder function. Usually the patient will volunteer the information that he is unable to void. In cases of shock or coma it is far safer to insert a urethral catheter than to take normal bladder function for granted. In this group of 201 cases only 40 cases (or 20 per cent) had normal sphincter function after injury and did not need catheterization.

TABLE 3. Low body temperatures and related data

TABLE 3. Low body temperatures and related data in six spinal cord injuries

CASE NO.	LEVEL	EXTENT	CAUSE	OPERATIVE FINDINGS	FREE AIR TEMP. MIN. MAX. MEAN.		DAY OF INJURY	D + 1	D + 2	D + 3	D + 4	D + 5	D + 6
80	C-5	COMPLETE	SHELL FRAGMT. — PENETR.	2/3 of spinal cord severed, rest appears soft, greyish.	56° - 72° ; 64° (Florence, Italy) May	Temp.	90°	94°	96°	98°			
						Pulse	90	90	90	90			
						Resp.	16	16	16	16			
						B.P.	78 / 40	80/40	80/40	86/56			
							• • •	↑ •					
63	C-6	COMPLETE	BULLET — PERFOR.	Spinal cord shows multiple defects, appears soft.	31° - 47° ; 39° (Munich, Germany) April	Temp.	82°-86°	84°-86°	88°-90°	96°-100°	103°-104°	105°-106°	
						Pulse	64	52	60	60 - 68			
						Resp.	14	16	16	16			
						B.P.	80/40	70/50	80/60	82/64			
							o •	•	•	↑			
25	C-7	COMPLETE	BULLET — PERFOR.	Spinal cord appears grossly intact, but soft.	35°-52° ; 43° (Saarburg, France) February	Temp.		92.6°	93.8°-97°			102.4°	106°
						Pulse		48	68 - 78			100	
						Resp.		11	16 - 18			26	
						B. P.		104/90	100 / 74				
							o •	•	•				
127	C-7	COMPLETE	BULLET — PERFOR.	Only thin strand of spinal cord remains.	34°-50° ; 42° (Ulm, Germany) April	Temp.	95.2-98°	98.2-98.6	101°		104 - 106°		
						Pulse	48-60-72	66-72	90				
						Resp.	24	24-28	32				
						B. P.	86/40-86/60	90/60	98/60				
							o •	↑ •					
94	C-7	COMPLETE	BULLET — PERFOR.	No operation.	56° - 69° ; 62° (Anzio, Italy) May	Temp.	84.7°	86.6 - 94°	96 - 99°	103-106°			
						Pulse							
						Resp.							
						B. P.							
							o •	•					
92	D-2	COMPLETE	SHELL FRAGMT. — PENETR.	Spinal cord anatomically trigssected.	44° - 63° ; 54° (Bologna, Italy) April	Temp.		92.8°					
						Pulse		9-16					
						Resp.		60-64					
						B.P.		84/54					
							o •	↑					

↑ OPERATION
o 250cc OF PLASMA
• 500cc OF CITRATED BLOOD
(+) DEATH

Bedsores. While all bedsores occurred in either completely or incompletely denervated skin areas, in one case a bedsore was found in an entirely normal skin area during the second week after the injury.

TABLE 4. *Causes and extent of spinal cord injuries*

Cause of injury	Complete spinal cord injury	Incomplete spinal cord injury	Total
Penetrating foreign bodies			
1. Shell fragments	52	43	95
Mine fragments	10	2	12
Mortar fragments	2	6	8
Bomb fragments	2	1	3
Hand grenade	1	1	2
Total	67	53	120
2. Bullets	34	26	60
Blunt injuries causing fractures			
1. Automobiles	6	4	10
2. Falls,* crushing injuries**	5	6	11
Total	11	10	21

*Including fall from roof, mid-air collision of parachutist, falls due to explosions
**From recoiling gun, collapsing house

CAUSES AND EXTENT OF SPINAL CORD INJURIES

The causes responsible for spinal cord injuries were foreign bodies and fractures. The two types of foreign bodies most commonly seen were shell fragments of various types and bullets (table 4). Shell fragments ranged in size from a silver dollar to a pinhead. In one case fine, sand-like lead particles were found. These had penetrated all overlying structures of the back, including the laminal arch, finally reaching the spinal cord. Oddly enough, these foreign bodies were so densely distributed that on roentgenogram they appeared as if Lipiodol (brand of iodized oil) or Pantopaque (brand of ethyl iodophenylandecylate) had been injected into the tissues. Most of the spinal cord injuries resulted from foreign bodies, only 10 per cent were caused by fractures.

Spinal cord injuries were fairly evenly distributed throughout the entire length of the spinal cord and cauda equina (fig. 3). In this review all spinal cord injuries were divided into complete and incomplete lesions. This refers to a functional, not an anatomic, interruption of the spinal cord or its tracts. There were 112 complete and 89 incomplete spinal cord injuries. Differentiating the various causative agents one can discern the effectiveness of bullets in the frequency with which they hit the cervical spine (fig. 4), whereas, no particular region is singled out by shell fragments (fig. 5). As in many larger series,

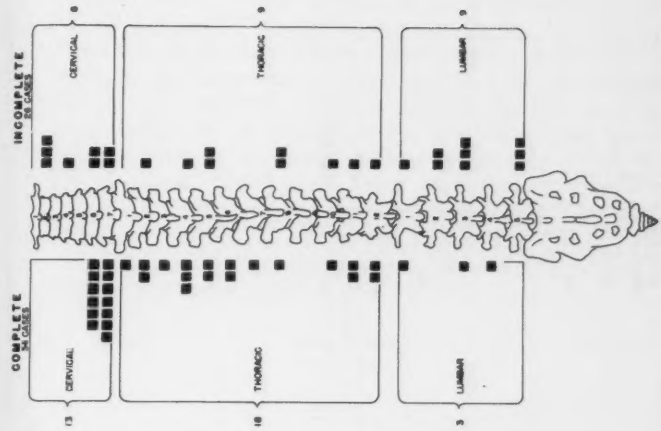

Figure 4. Site of complete and incomplete spinal cord injuries caused by bullets in 60 cases.

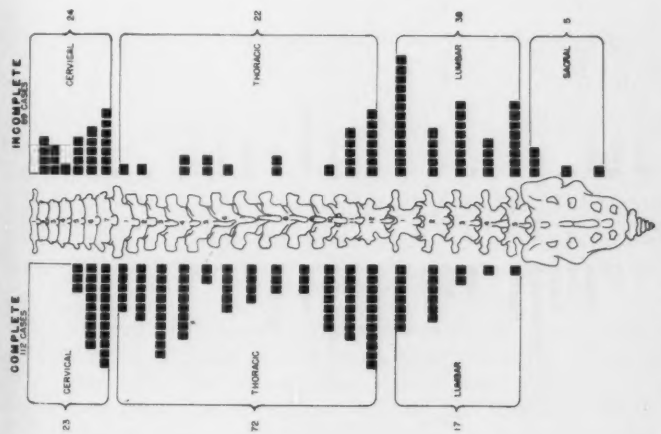

Figure 3. Site of complete and incomplete spinal cord injuries in 201 cases.

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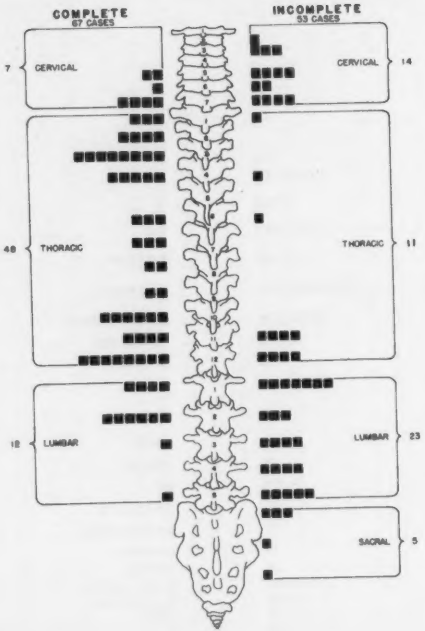

Figure 5. Site of complete and incomplete spinal cord injuries caused by shell fragments in 120 cases.

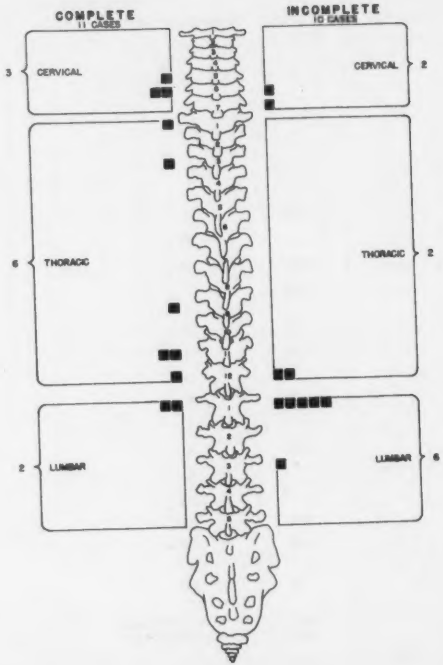

Figure 6. Site of complete and incomplete spinal cord injuries caused by fractures in 21 cases.

cervicothoracic and thoracolumbar junctions are well known as sites of fractures (fig. 6). Correlating these various agents with the degree of spinal cord injury, one sees an almost evenly divided group of complete and incomplete lesions in fractures. In the shell fragments the prominence of complete lesions in the cervical and thoracic levels is quite evident, 55 complete lesions as against 25 incomplete lesions (fig. 5). The opposite holds true for all lesions below these levels. A similar relationship applies to bullets as a cause and may be explained by the mobility of the cervical vertebra and its ability to accelerate following impact by a foreign body. The lower one goes along the spinal column, the less mobile and more fixed does the vertebra become, thereby securing the enclosed cord against too rapid acceleration and greater histologic damage.[5] Comparing spinal cord with cauda equina injuries, one also finds twice as many complete injuries in cord lesions and a reverse relationship in caudal injuries (fig. 7).

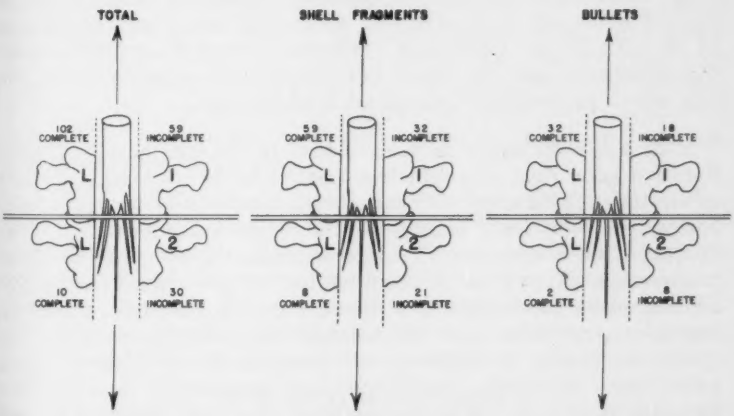

Figure 7. Differences in extent of damage between spinal cord and cauda equina injuries.

The marked difference in damage caused by the various types of missles is of interest. Mine fragments caused five times as many complete as incomplete spinal cord injuries, whereas mortar fragments had a reverse ratio of 1:3 (table 4). Both types of explosives have very short distances to travel but the penetration power in a mine is far greater than that of the smaller mortar shell. The muzzle velocity of bullets (about 3,000 feet per second) is twice as fast as that of shell fragments (up to 1,500 feet per second). Furthermore, bullets lose relatively little speed on their way in contrast to the irregularly shaped shell fragment that decelerates considerably with increased distances.

Figure 5. Site of complete and incomplete spinal cord injuries caused by shell fragments in 120 cases.

Figure 6. Site of complete and incomplete spinal cord injuries caused by fractures in 21 cases.

Yet, with the exception of the small group illustrated in table 3, in which bullet injuries were twice as common as shell fragment wounds, there is very little difference in this larger group in the ratio of complete to incomplete injuries caused by either missile. No adequate explanation can be offered in this respect.

INDICATIONS FOR LAMINECTOMY

At the beginning of World War II the guiding neurosurgical principles were outlined by neurosurgeons who had had experience in World War I. Their negative attitude toward surgical intervention in spinal cord injuries was determined by the poor results and high mortality rates of World War I. "Eighty per cent died in the first few weeks; only those cases survived in which the spinal lesion was a partial one." If complicated by serious wounds of chest or abdomen, cases were considered inoperable. Even after the elimination of 8 cases considered inoperable, 15 patients of the 24 operable cases in Harvey Cushing's series died.[6] Besides, there was undoubtedly a lack of interest in the subject of spinal cord injuries. About half the pages of Volume XI of the official World War I Surgeon General's report[6] covers craniocerebral and the other half peripheral nerve injuries and only seven pages deal with spinal cord injuries.

It is not surprising, therefore, that in the beginning of World War II a good deal of confusion existed as to treatment of these casualties. Gradually, with increasing numbers of laminectomies performed, two basic principles evolved. A laminectomy is indicated if there was the slightest doubt that a complete anatomic transection existed or if compression of the spinal cord could be demonstrated. Neither the history nor the findings of a neurological examination can differentiate between physiologic, possibly temporary, interruption of function in an injured spinal cord from anatomic, permanent and irreparable damage. The demonstration of cord compression has its difficulties too. Queckenstedt's test is not always reliable; it was rarely done in this group and gave eight correct and six false readings in later demonstrated obstructions. To rule out compression of the spinal cord by roentgenogram was at times impossible because the only available equipment, being portable, could not give details of vertebral or laminal outlines. To look, even with the help of stereoscopic views, for evidence of bony fragments in the spinal canal was futile under those circumstances. Even with the best roentgenographic equipment available, the neurosurgeons usually were surprised with the far greater actual damage found at operation contrasted to the presumed damage as judged from the films. Also, where the roentgenograms seemed to indicate complete anatomic destruction of the spinal cord by the presence of a large foreign body in the spinal canal, or by

demonstration of extensive damage to the spinal column, this was actually an uncommon finding on direct inspection. In this group it occurred only in 12 cases from a total of 112 complete spinal cord injuries. Because of these factors many more laminectomies were done in World War II and even if, in the final count, the results are as disappointing to some observers as they were to those of World War I, "It was the humane thing to do and gave the patient and his family a clear cut prognosis."[7]

While more obvious progress was made and better end results were obtained in the care of brain or peripheral nerve wounds of World War II, the advance made in the care of spinal cord injuries was not so much in new technics or methods as in the attitude of a new generation of neurosurgeons. This attitude in turn upheld the morale of the patients and was responsible for a positive and optimistic approach to every new problem or complication in the chronic care of these spinal cord injuries. Whatever principles one abides by, the final result of whether the patient is clinically improved or remains unchanged should not determine one's course of action. Furthermore, in a wound from a foreign body, there is no reason why the surgical principles to debride a wound tract and to remove the foreign body, if accessible, should not be applied to spinal cord injuries as well. This same attitude should apply to spinal cord damage due to closed injuries also.

In civilian life, if all other methods fail, Pantopaque or related radiopaque materials are employed to determine the presence or site of cord compression. This method was never applied in any of the cases under consideration. The necessary equipment and the time were not available in the forward hospitals for this type of examination. There is, of course, no reason why it could not be employed when feasible.

COMPLICATING INJURIES

It is an important finding that one-third of all cases of spinal cord lesion were accompanied by perforating wounds of chest, abdomen or both, and in a few cases involving the kidney as well (table 5). As might be expected there was a correlation between the anatomic level of the spinal cord injury and these perforating wounds. In cervical and upper thoracic cord lesions chest perforations alone were observed (fig. 8). Two-thirds of the cases of combined chest and abdominal cavity wounds had cord injuries close to the thoracolumbar junction of the spine (fig. 9) and practically all abdominal perforations and penetrating wounds of the kidney were seen in cord injuries at the lumbar level (figs. 10 and 11). These perforating wounds in themselves present a more serious problem than the cord injury as far as immediate care is concerned.

The answer to the question of what injury should have therapeutic priority or the decision to postpone definitive treatment of one of the two lesions is not always obvious or easy. Fre-

TABLE 5. *Wounds associated with spinal cord injuries in 201 cases*

	Number of cases	Per cent
No wounds or moderate wounds	142	70
Severe wounds	59	30
Penetrating wounds of chest cavity	36	18
Penetrating wounds of chest and abdominal cavity	12	6
Penetrating wounds of abdominal cavity	10	5
Laceration of kidney	7	3.5

quently the handling of the problem in the early postoperative course seemed quite satisfactory to the forward surgeon only to impress the medical officer at the base as inadvisable therapeutic management. This impression was formed after observation of cases that reached the base hospital with severe secondary anemia, marked loss of weight or with extensive bedsores. In these cases several operative procedures had been compressed into a relatively short time of 24 to 48 hours at the forward hospitals. The operative procedures in question ranged from simple debridement to laparotomy. It should be pointed out that the over-all postoperative course was ever so much smoother where the laminectomy was delayed until the patient had recovered from the early postoperative effects and therapy of a hemothorax or perforated viscus. The practice, seen not infrequently, of turning a patient on his back immediately after a laminectomy in order to do a cystotomy seems hasty and unnecessary, if one considers a cystotomy an elective procedure to be performed at any time. These observations should not be interpreted as a hard and fast rule, for, in some cases a spinal cord lesion, as well as complicating injury, may require immediate therapy. For instance, a cerebrospinal fluid leak should be repaired at the earliest possible moment regardless of what other major surgical procedures are indicated. A sucking chest wound or a perforated viscus also must have priority and immediate care regardless of all other coexisting wounds. Once an operation has been decided upon it should be performed promptly.

Figure 8. Anatomic relationship of penetrating wounds of chest cavity associated with spinal cord injuries in 36 cases.

Figure 9. Anatomic relationship of penetrating wounds of chest and abdomen associated with spinal cord injuries in 12 cases.

In addition to accompanying injuries, other complications may arise that might caution the surgeon against immediate operation. Wound tracts crossing the proposed site of laminectomy may have become grossly infected, presenting distinct hazards on the postoperative course. These infections are most commonly

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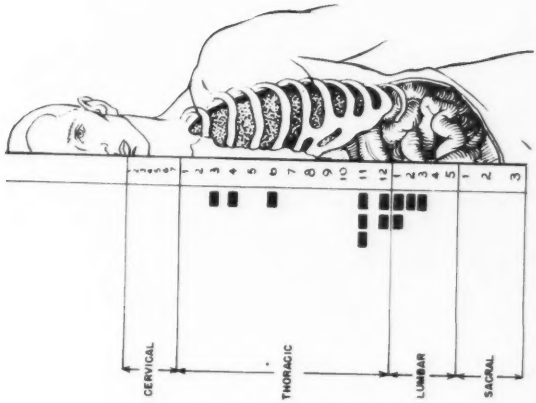

Figure 9. Anatomic relationship of penetrating wounds of chest and abdomen associated with spinal cord injuries in 12 cases.

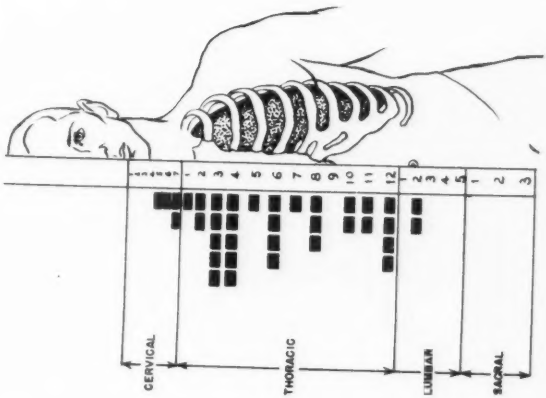

Figure 8. Anatomic relationship of penetrating wounds of chest cavity associated with spinal cord injuries in 36 cases.

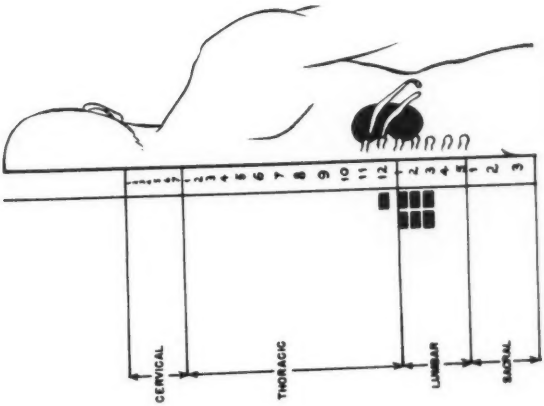

Figure 11. Anatomic relationship of penetrating wounds of kidney associated with spinal cord injuries in 7 cases.

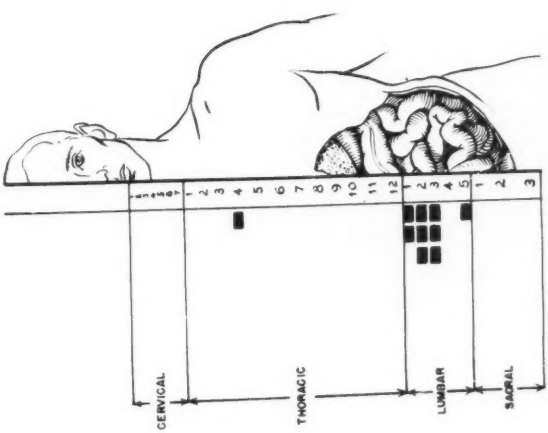

Figure 10. Anatomic relationship of penetrating wounds of abdomen associated with spinal cord injuries in 10 cases.

In addition to accompanying injuries, other complications may arise that might caution the surgeon against immediate operation. Wound tracts crossing the proposed site of laminectomy may have become grossly infected, presenting distinct hazards on the postoperative course. These infections are most commonly seen when difficult terrain or certain strategic situations have delayed the collection and evacuation of casualties who then reach the hospital late (table 2). In such cases two courses of therapy were chosen; the first was immediate operation, disregarding the infected wound tract, the second was to wait until the infection had cleared up sufficiently or completely to permit definitive surgery and closure of the operative wound. In defense of the first course of therapy, it should be stated that, in this series, we saw only mild and inconsequential postoperative infections, only in three cases leading to fatal meningitis. After the wound tract was cleaned out and the foreign body removed, wound infections cleared up rapidly. In defense of the second course of therapy, a clean operative field will, of course, lessen the risk of any postoperative infection and most likely reduce the number of postoperative adhesions that are invariably present. A good deal depends on the extent of the wound, the severity of the infection and the amount of success in preparing a wound for operation. We observed no distinct policy but were inclined to wait until the infected wound had cleared up, if the patient did not show any aggravation of his clinical signs and symptoms. In this connection, a daily and sometimes hourly check-up and comparison with the findings on admission should not overlook the function of the bladder. More than once a patient was admitted, able to void, who lost his voluntary bladder control while waiting for operation. Not only does it take a good deal of time to regain normal sphincter or bladder function but it also adds another burden to the already difficult postoperative care.

OPERATIVE TECHNIC

The technic followed corresponds closely to the usual decompressive laminectomy as done in civilian life, with the skin incision in the midline (fig. 12). As the wound entrance frequently lies near or at the proposed site of a midline incision, two procedures were followed: (1) Wound entrance, wound exit, or both, together with wound tract, were excised and the resulting defect enlarged further to expose the damaged lamina (fig. 13). (2) The wound tract is left alone, the surgeon circumvents it, if necessary, with the help of a curved incision away from the midline, and only at the very end of the laminectomy and its tight closure separately debrides the wound of entrance (fig. 14). The latter method has been preferred by most surgeons. In accordance with treatment of most war wounds of World War II, the debrided wound tract was powdered with a sulfanilimide compound or an anti-

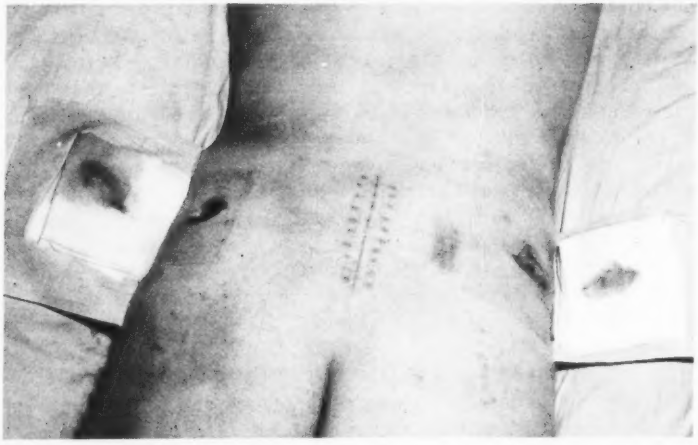

Figure 12. Perforating wound of lumbar spine (entrance to left, exit to right) with healed midline laminectomy incision 7 days after operation. Incomplete spinal cord injury at L_5.

Figure 13. Complete spinal cord injury at Th_5 from perforating wound of spine. Round debrided wound of entrance visible at upper end of curved skin incision which overlies the laminectomy. Incision represents also the closed and debrided wound of exit. This was almost of equal extent and was quite irregular in outline. The imprint of the just removed dressings upon the anesthetized skin area shows the danger of impending bedsores.

biotic, covered with vaseline gauze and left open. The laminectomy should extend well beyond the site of the cord injury, preferably the width of one-half to an entire lamina at both ends, the resulting exposure and decompression of the cord being much more satisfactory. When treating depressed laminal fragments the same technic should be followed as for depressed skull fractures, namely, to start a laminectomy in an undamaged area and gradually work toward the depressed fragments, lifting them out

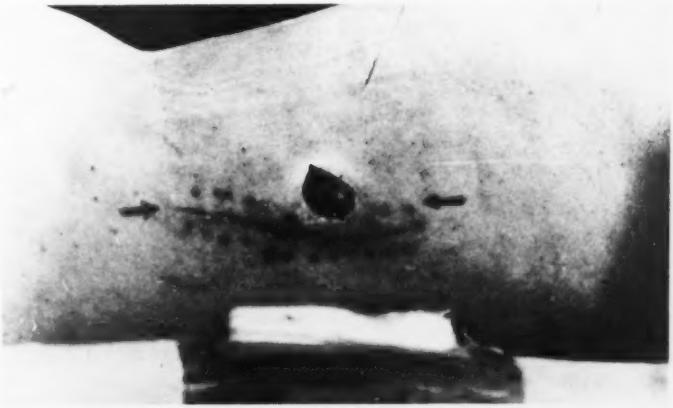

Figure 14. Complete spinal cord injury at L_1. Laminectomy incision circumvents debrided wound of entrance that lies in the midline.

cautiously to avoid additional trauma. In doing so one should be prepared to encounter bleeding from three sources: The first of these sources is from the epidural veins anywhere along the spinal column. The second source of bleeding is from the azygos vein in the thoracic segments. This was encountered in lateral wounds entering from the chest or abdomen. During the laparotomy or thoracotomy these azygos hemorrhages are accessible and relatively easy to control. They are, however, very difficult to reach from the customary laminectomy approach and occur usually when loose fragments of bone are lifted out, having until then compressed severed blood vessels. The third source of bleeding may be the vertebral artery, which may start a severe hemorrhage on removal of a relatively small bone fragment from a damaged transverse process. This was encountered in one case and was quite difficult to control.

No agreement exists whether or not to open the spinal dura mater. It has been the author's personal policy to open the dura, expose and inspect the damaged cord in every case unless the operative site was grossly infected, making this step inadvisable. Especially in instances of foreign bodies located extradurally, this policy was found necessary because further pathologic findings were encountered under the dura, such as small later-

ally located bone fragments or adhesions in older spinal cord lesions. Especially in fractures, dislocations or fracture-dislocations of the spine with resulting compression of the cord the dura should be opened. Frequently one finds the dura not pulsating even after satisfactory decompression of the lamina. This finding alone should point to an underlying pathologic condition and suggest exposure of the damaged spinal cord itself. As contraindication against this practice textbooks refer to "uncontrollable herniation of a softened cord." This condition is actually not uncontrollable and was encountered in six cases. What actually happens is a spontaneous evacuation of devitalized spinal cord material once the confining dura mater is opened. Whatever viable spinal cord substance exists will remain intact and *in situ*.

The argument against opening the dura in cases of spinal cord swelling for fear of adding further damage to an already involved tissue has never been convincing to this author. When, following the dural opening, the cord was too swollen to allow dural closure without tenseness, grafts from superficial or deep fascia should be used. Efforts are always directed to combat any edema of the central nervous system, and there is no reason why this should not apply to the spinal cord as well. It is important to make the dural closure tight. Superficial or deep fascia were used with good results and without cerebrospinal fluid leaks or postoperative infections. After removal of bone fragments and foreign bodies the cord should fall back into its proper place. It must be remembered that there is usually ample space for the cord in the spinal canal, especially in the cervical area. If the spinal cord still seems crowded one should look for further pathology, at first extradurally.

Fractures, dislocations or both are not always obvious or brought out by roentgenogram. Foreign bodies or bone fragments located in the anterolateral aspect are not always seen immediately. They have a tendency to push the cord out of its bed, simulating subdural or intramedullary fluid collections. Hematomata are rare; one was found extradurally at Th_{10} in a bullet wound, another distinctly walled off under the arachnoid at L_3, three segments below the original bullet injury at Th_{12}. It was suspected when a fine rubber catheter was passed down and encountered resistance after removal of compressing bone fragments and persistence of a quiet, nonpulsating dura. To pass a catheter is a most useful maneuver and should be employed in all cases in which pathology is suspected in spinal cord segments that are not uncovered and open to inspection. A third hematoma was found subdurally at the level of injury, caused by a land mine compression fracture at L_1, in the form of a semisolid clot 15 days after the original injury.

(To be concluded)

SOLDIERS, STOCKADES, AND PSYCHIATRY

EDWIN T. COOKE, *Major, MC, USA*

THE evolution of a sound, acceptable, and economical system of participation in the stockade program by the local psychiatric staff is a natural development from interest in its many inherent and associated problems. Faced with the necessity of providing psychiatric care which varied from emergency calls for hysterical attempts at suicide to routine certification of mental responsibility, it soon became apparent that not only was the stockade a natural collecting point for many chronic offenders and other soldiers who were unfit for further service but that a significant contribution could be made to the stockade program itself. A major problem that became apparent involved the discovery of a practical method of integrating the stockade into the general goals and purposes of the military structure.

The tendency to ignore obvious solutions to the problem and to resort to indefinite deferment often seems to stem from the attitude that the stockade is a unit apart from ordinary military function, that its only purpose is punishment, and that its population is composed of a human species, neither civilian nor soldier, who should best be forgotten. From the philosophy of "out of sight and out of mind" evolves a custodial type of stockade program. The staff members of the stockade become mere custodians, charged with the responsibility of keeping the prisoners fed, sheltered, and reasonably busy. The stockade then tends to become a place to hide products of poor leadership, "eight balls" who cause administrative headaches, misfits who have no potential military value, and habitual offenders who are again court-martialed in the spirit of vengeance. It often is seen as a last resort in dealing with chronic alcoholism, a method of isolating the sexual deviate, and a means of defering or avoiding decisions on problem soldiers.

Another philosophy which may be applied to the post stockade, the one apparent in Army Regulations and directives, is that the stockade has an integral part in the military structure and that its purpose is only incidentally custodial. Military confinement as a means of punishment is, like all punishment, not an end

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in itself, but the means of achieving a goal or goals. It is a disciplinary measure—a way of rewarding misconduct and of indicating the attitude of the military society toward the act, not the person. It serves as a deterent both as to future violations on the part of the individual, as well as to the military population as a whole. It also is intended to make of the individual a better soldier and to extend to him the opportunity for rehabilitation. Punishment in the military service, therefore, is principally a means to an end—the production of a better soldier. The stockade as an instrument to this end cannot function properly if its own program defeats this purpose.

In comparison with its civilian counterpart, the stockade is unique in many ways. It is not an institution for long-term confinement. It does not ordinarily house prisoners who must be isolated from society. The majority of its population are military offenders who for similar offenses in civilian life would not be imprisoned, and, finally, the prisoners are soldiers. This point should be emphasized. They were soldiers before coming into the stockade, they are soldiers during their confinement, and for the most part will be soldiers after they have been released. From the simple observation that the prisoner is a soldier, it is logical that he should be treated as a soldier, expected to act as a soldier, and that any rehabilitation should be oriented toward making him a better soldier.

Previously, some in the stockade population have proved that they neither have the capability nor the desire to be soldiers. Their past behavior usually fits well the descriptions contained in the various regulations, and firm directives make their elimination relatively simple. Others have potential value to the service and/or are sufficiently well motivated to perform creditable service. If they could be identified, each group naturally would develop a different relationship to the stockade and the functions of the stockade would be different in each case. It would be difficult to justify a program that required that the soldier who had committed some minor offense and the person imprisoned for repeated AWOL's pick up cigarette butts together as the sole rehabilitative effort. Equally difficult to comprehend would be a program that extended the same privilege to both the chronic offender destined to be discharged and the soldier who could be expected to render meritorious service in the future. Inasmuch as their destinations are clearly different, their management in the stockade should be distinctly separate.[1]

The first contribution that can be made is aid in the establishment of a stockade evaluation program for the classification*

*The terms classification, prerelease interview, and evaluation refer, unless otherwise indicated, to the procedures accomplished as a part of the routine psychiatric processing and should not be confused with similar terms used in the processing of the soldier by the stockade staff.

of those soldiers who do, or do not, have some future value for the service, and the recommendation for elimination of those with no rehabilitative potential.

In establishing such a program for the identification of the potentially capable prisoner and the elimination of the noneffective soldier, the following assumptions were evolved:

1. There is a substantial percentage of prisoners now in confinement who, because of unfitness or unsuitability, cannot be expected to perform satisfactory service upon their release from confinement.

2. Many unfit and unsuitable soldiers are being returned to duty where they continue to perform at a substandard level and return to the stockade or are eventually discharged.

3. Those prisoners who are found to be unfit or unsuitable should be considered for administrative separation from the service while in the stockade prior to their return to duty. This could be done in compliance with current policy and regulations.

4. Noneffective prisoners should be identified and managed separately from those capable of responding satisfactorily to efforts of rehabilitation. A program of rehabilitation should be directed at those able to profit from it.[2]

INITIAL STUDY

Procedure. In January 1956, the mental hygiene consultation service at Fort Meade, Maryland, initiated an evaluative study of prisoners leaving the post stockade, the basic purpose of which was to determine what percentage of prisoners are being returned to duty who are considered unsuitable or unfit under Army Regulations 635-208 and 635-209.[3,4] A secondary aim of the study was to determine the feasibility of establishing a screening program by which these noneffective prisoners could be identified.

A representative sample of prisoners who completed the greater part of their sentence and who were about to be discharged was chosen for study. This sample comprised about 10 per cent of the total prisoner population. Information pertaining to each prisoner was gained through interviews with a social work officer and through a review of the prisoner's personal records. The personal interview was used, not only to obtain additional information but also to evaluate the prisoner's existing attitudes, motivation, and characteristic patterns of interpersonal behavior. Information was obtained on each prisoner relative to age, race, marital status, length of service, and component; family and marital history; school and employment history; military history; civilian and military disciplinary record; and nature and causation of past and present offenses. Evidence of success or failure in meeting crucial social and psychologic stress such as relation-

ships with parents, school adjustment, and employment, together with the prisoner's prior adaptation to the military service were used as the principal prognostic indicators rather than place any strong reliance on psychometric tests[5] or impressions of clinical pathology. In effect, technics of proven effectiveness, such as described by Glass and associates,[6] in addition to the record of military adjustment were used.[7]

In order to expedite the study, those prisoners who had three or more court-martial convictions during their present enlistment were considered as "unfit," that is, their disciplinary records alone were considered as sufficient basis for their presentation to a board authorized under the provisions of Army Regulation 635-208. It was not the function or the intent of this study to rigidly define the "unfit soldier." There was complete awareness that this is the rightful function of the unit commander and the "208 Board" concerned, and that each case must be considered on its individual merits and arbitrary and incomplete criteria could not be applied to all cases in an untempered fashion. It was thought that this criterion of three court-martial convictions, though less comprehensive, was not inconsistent with the spirit of Army Regulation 635-208. The classification of prisoners as "unsuitable" was based on the presence of such personality defects as outlined in Army Regulation 635-209.

Those prisoners who were not classified as "unfit" or "unsuitable" by the interviewing agency were considered for purposes of this study as likely to benefit from rehabilitation. Although this category is defined somewhat negatively, it was thought that this was in keeping with existing Army policy on administrative separation. Where there was no positive evidence that a person had an extensive disciplinary record or some serious personality defect which would preclude satisfactory service in the future, it was believed that efforts should be made to rehabilitate that person and to retain him in Service. For the most part, the men in this category had been or showed promise of being good soldiers. The offense they had committed was in response to some particular problem which had no reflection on their over-all ability. Personal interview with these soldiers frequently brought to light specific stresses such as domestic crises or job malassignments which helped to precipitate the offense. Specific attention directed at the solution of these problems would have been a positive step in the rehabilitation of these men.

Findings and discussion. Of the prisoners about to be released from confinement, 36 per cent were found to have records of three or more court-martial convictions during their current enlistment. Such a disciplinary record is sufficient to cast considerable doubt on a person's fitness for service. It was suggested that these men might have been considered for presentation

to a "208 Board" on the basis of established administrative criteria.

Twenty-four per cent of the prisoners about to be released from confinement were judged by the interviewer to have sufficient personal inadequacies to warrant presentation to a "209 Board" established under provisions of Army Regulation 635-209 for consideration. The large percentage of inadequate personnel about to be returned to duty indicated that, for one reason or another, these soldiers were not being identified even after they had been brought to the attention of their unit commanders by one or more disciplinary infractions.

Forty per cent of the prisoners about to be released from confinement were not classified as "unfit" or "unsuitable." Thirty-two per cent of the prisoners demonstrated promise of being good soldiers while the remaining prisoners were considered to be questionable cases who should be given the benefit of the doubt and returned to duty. Those that had been considered for administrative discharge under the current system of identification constituted a negligible percentage of the group investigated.

In general, the assumption that unfit and unsuitable personnel could be identified effectively at the post stockade was supported by this study. From the findings it was concluded that: 1. It seems preferable to identify and process the substandard soldier while in the stockade rather than return him to his unit for processing. Releasing him to duty affords the man another opportunity to commit a new court-martial offense before discharge can be effected. 2. Such a procedure does not return to the company a man most likely to be a bad influence on the morale of the others and does not prolong unnecessarily the time that an unsatisfactory soldier must be maintained at government expense. 3. Processing the man while in confinement causes no disruption and minimizes the administrative inconvenience to his organization. 4. Locating the evaluative program in the stockade has an advantage in that it would benefit the confinement officer in his rehabilitative efforts. 5. If the stockade is to return men to duty better fitted for service than they were at the time they committed their offense, one of its functions must be that of re-educating or retraining. It appeared the screening agency would be able to aid in identifying for the confinement officer those men capable of profiting from such measures and make specific recommendations on the handling of prisoners as the need for individual attention arose.

The findings and the experience encountered in this study clearly demonstrated areas in which the professional services of a psychiatric unit could be used and gave some general idea as to how this might be done. Several factors limiting the establishment of procedures, programs, and policies became equally

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obvious. The experience in administering and in making use of the necessary measures was for the most part inadequate. A smooth, well worked out program with intricate co-ordination and careful planning could not be imposed *en masse* on the present organization. Those even remotely connected with the stockade, from the post commander to part-time guard, must understand and be sympathetic with the program. It therefore became necessary to implement the program step by step, examining success or potentialities, and above all proving to all concerned that the practical benefits derived more than compensated the necessary effort required. The progressive implementation of the program covered an 18-month period from January 1956 to July 1957 and was established essentially as indicated in the subsequent description. It is not presented as a finished product. Many areas need further exploration, research, expansion, and verification but, as judged by ease of administration, enthusiasm of its participants, minimal personnel demands, flexibility, practical acceptability, and the appropriateness of its goals in compliance with those of the military, it is worthy of presentation.

TABLE 1. *Statistical breakdown of 170 prisoners in post stockade at time of intake interview*

		Number	Per cent
Source of prisoners	Special processing detachment	78	46
	Post units	51	30
	Off-the-post units	41	24
			100
Incidence of court-martial	Court-martialed	70	41
	To be court-martialed	100	59
			100
Offense*	Desertion	33	19
	AWOL	107	62
	Larceny	11	6
	Insubordination	6	3½
	Assault	4	2½
	Miscellaneous offenses	12	7
			100

*Three of the 170 prisoners were charged with two offenses each.

The prisoners screened under this new program came from off-post units, a detention detachment, post units, and anti-aircraft units. Table 1 shows a monthly statistical breakdown of prisoners at the time of intake and is considered typical of such reports.

The entire responsibility for the over-all operation of the program was assumed by the confinement officer. He made the final decision as to which prisoners would be recommended to their commanding officers for board action. This responsibility of the confinement officer in no way violated the prerogative of the unit commander to initiate administrative board action for substandard personnel in his command. The commanding officer would accept or reject the recommendation of the confinement officer as he saw fit.

The role of the consultation service in the program was to provide technical training and supervision for the social work specialists interviewing the prisoners, and accomplish psychiatric evaluations and clearance of prisoners where indicated. The entire screening process (figs. 1 and 2), was conducted by enlisted social work specialists who were assigned from the Consultation Service to the MP unit providing support for the stockade.

INTAKE PROCEDURES

Data for the entire program were developed from the information gathered and evaluations made during the intake procedure, which was part of the routine processing of each prisoner. The intake interview was accomplished within 24 hours after admission by the enlisted specialists conducting the program. Conducting intake interviewing soon after admission prevented the incoming prisoner from being influenced before the interview by prisoners already in the stockade and gave the specialist the opportunity of using to his advantage the emotional impact of initial confinement, which often caused the soldier to reveal feelings which otherwise might have been hidden. The intake interview included the orienting of the prisoner and the gathering of information for further use in classification and rehabilitation.

Interview. During the interview, the specialist reviewed, in a rather permissive manner, the reason for the prisoner's being in the stockade, conducting a general discussion of some of his problems with the implication that in some way he could be helped to solve it. The attitude of the specialist was one of acceptance with very little questioning. He made his position clear—his position as a part of the stockade rehabilitation program with no other interest or reason for asking about the prisoner's background, assuring the prisoner that the questioning had nothing to do with investigation for court-martial procedures. In his relationship with the soldier, the enlisted specialist remained neutral as far as possible, not identifying himself with either the prisoner or with the staff of the stockade.

The limited social history which he obtained concerning the prisoner included military, work, social, family, and school ad-

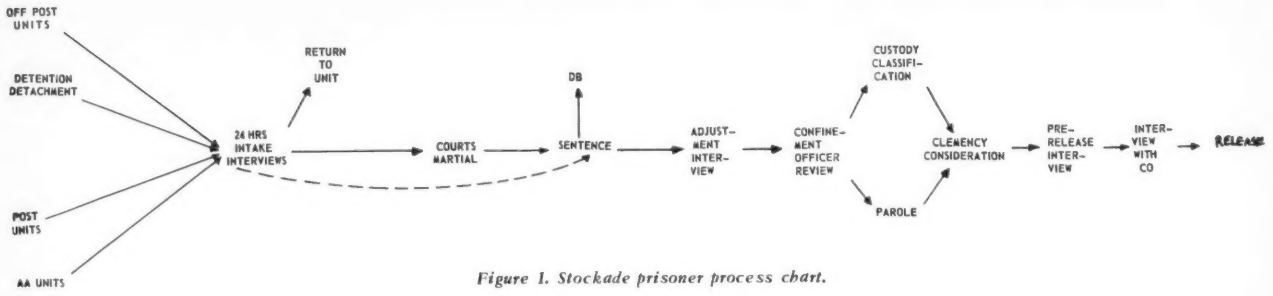

Figure 1. Stockade prisoner process chart.

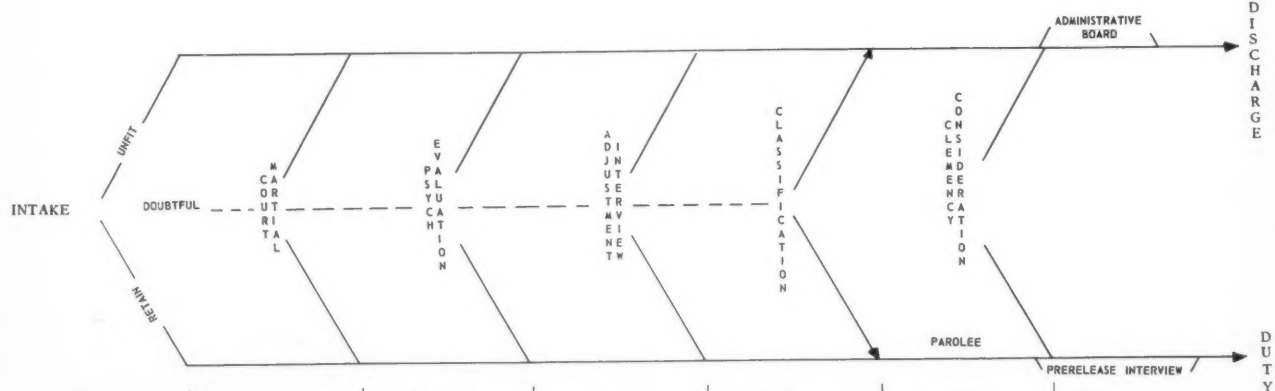

Figure 2. Process flow chart of screening agency.

justment. How did he get along with his family? How had he fared at school? What was his status scholastically? How had he adjusted and progressed at work? Had he had any difficulties in military assignments? Often during the course of the discussion, the obvious motivation for disciplinary difficulties disclosed was situational, for example, financial difficulties or inconsistencies in military assignments.

Administrative procedures. In addition to conducting the interview, the specialist had certain administrative duties related to intake. As indicated, he sent for collateral information, including medical reports, home and social reports, and police and school records. The collateral information was an asset in attaining the objectives of the program because it made disposition clearer and added to information concerning prior adjustment. The specialist attempted as far as possible to collaborate information on details of the difficulties described by the prisoner and to obtain a clearer picture of the possible situational stress surrounding the offense.

The specialist also reviewed the prisoner's records of previous offenses, efficiency and character ratings, letters of commendation, and other information useful in evaluating the prisoner. This included obtaining, abstracting, and evaluating the prisoner's 201 File. The information obtained from the 201 File reflected additional information, such as frequent shifts in assignments and previous military occupational specialties. It gave a rough idea of some of the prisoner's assets, such as specialized training and positions of responsibility and some of his deficits, such as prior disciplinary offenses and low efficiency and conduct ratings.

Figure 2. Process flow chart of screening agency.

Inasmuch as it is the prerogative of the unit commander to initiate administrative discharge procedures on noneffective personnel under his command, his opinion of the prisoner was requested so that he could evaluate various areas of military adjustment and present his viewpoints as to the prisoner's potentiality in the military setting. The commander was requested to rate the soldier as critically and as accurately as possible and in comparison to other men in the unit who were of similar experience, rank, and length of service. To obtain this information, the specialist forwarded a questionnaire, the Individual Rating Scale, to the commander. The Individual Rating Scale was a detailed form containing questions with a multiple choice of answers provided for each. It was necessary only to place an (X) along the line of the most appropriate answer, cross out words considered inappropriate, or add words considered necessary. A detailed form was used because it was easy to complete and, for this reason, more likely to be fully answered. It covered a wider range of information than the usual questionnaires. In

addition, by completing the form, the commanding officer often committed himself to future actions.

After obtaining all the available information on the prisoner, the specialist made an appraisal of the potentialities of the prisoner for further service.

Significance of the intake procedure. In the intake interview, it was of help to the prisoner to know that in his contact with the specialist he had found someone who was interested in his problem, that some attempt was being made to give him help, and that if confinement was indicated for him it would not be a completely barren experience. In this interview, some of the prisoner's problems were identified; aid in their solutions from then on would be a continuous process for the period of confinement. To the basic information and evaluations resulting from the intake interview would be added more information and new evaluations based on results of the adjustment interview to be conducted later; observations of, and reports on, the prisoner's behavior in the stockade; and a continuing evaluation of the prisoner's adjustment. Additional information would be obtained through review of the prisoner's weekly stockade records and contacts with guards and custodial personnel; and would involve such aspects as the prisoner's appearance, attitude, work performance, and conformity to rules. The problems of the prisoner were handled in continuum—from the time of intake to the time of release.

INITIAL CLASSIFICATION

On the basis of the information gathered and evaluation made in the intake interview, records review, and responses of the unit commanders to the questionnaire, the prisoners were tentatively divided into one of three categories: (1) those considered unfit or unsuitable for further duty as defined in various regulations, (2) those whose potential needed further evaluation, and (3) those who appeared capable of responding to rehabilitation. If a prisoner had an emotional problem of sufficient severity, he was referred to the consultation service. If he had a problem which normally was handled by the medical officer in the stockade or by agencies such as the Red Cross or the Army Emergency Relief, the appropriate referral was made. If after intake a prisoner was identified as rehabilitative all the material that had been gathered concerning him was referred directly to the consultation service for further review to determine if additional action or more formal therapy was warranted.

Those considered unfit were recommended to their commanding officers for administrative board action. Certain criteria within limits of Army Regulations 635-208 and 635-209 and Second Army directives were established to identify tentatively

substandard personnel. These criteria were applied by the enlisted specialist, confirmed by the consultation service, and reviewed by the confinement officer. Prisoners having three or more court-martial convictions on their current enlistment or frequent punishment under Article 15 of the Uniform Code of Military Justice,[8] or other disciplinary difficulties in combination with one or more previous court-martial convictions were considered candidates for separation under Army Regulation 635-208. One prior conviction was regarded as sufficient when the offense had been an especially serious one, such as larceny, and where, because of the character and history of the prisoner, the likelihood of future repetition was great. The unsuitable category was determined by the presence of disabling personality defects as outlined in Army Regulation 635-209. These defects were initially identified through the personal interview and other evaluative procedures and were confirmed by a review of such cases by the consultation service.

When it was decided to recommend a prisoner for board action, a letter setting forth the recommendation and the reasons for it together with any pertinent psychiatric reports, was sent to the commanding officer concerned. The recommendation that the commanding officer initiate action was signed by the post commander, since his recommendation carried with it more of a note of authority. The post commander also constantly reviewed criteria for presentation to the board. In the recommendation the commanding officer was advised that the prisoner could be processed for board action while still in confinement. (The unit commander could still, of course, initiate board action on confined personnel without a recommendation from the confinement officer.) In some cases it was brought to the attention of the commanding officer that there were other bases for administrative discharge which had been discovered, such as fraudulent enlistment. Very often it was found that the commanding officer was unaware of some of the factors involved, and this program offered a method of giving him further information which might be a basis for his decision.

It was natural that there would be some cases in which there would be a certain element of doubt. Doubt may have been initially due to insufficient information; however, there were cases in which, even with sufficient information, there was still some doubt. These prisoners were retained and further evaluations made. Occasionally, doubt was resolved on the basis of the prisoner's behavior in the stockade.

In general, the rehabilitation potentiality of prisoners was determined by evidence of (1) reasonable degree of success in prior employment, school work, and family relationships; (2) essentially healthy interpersonal relationships; (3) basic motiv-

ation to fulfill obligations and responsibilities; (4) reasonable emotional health; and (5) satisfactory previous military duty.

When the sentence of a prisoner did not indicate confinement, the case was referred to the consultation service for further action. If sentences of prisoners were for periods in excess of 6 months, they were usually sent to a disciplinary barracks with little delay.

ADJUSTMENT INTERVIEW

The next step in the processing of the prisoner was the adjustment interview, which also was conducted by the enlisted specialist. During the time between the intake interview and the adjustment interview, the prisoner had usually developed certain attitudes toward the Army, the stockade, and the idea of confinement. He already had been sentenced at the time of the adjustment interview and perhaps was experiencing a sense of relief in contrast to a feeling of hostility or apprehension experienced before the court-martial. By this time he had made an appraisal of himself, and there was a reflection of the way he was influenced by groups in the stockade. Very often a profound change had taken place in the general attitude of the prisoner during the time between the two interviews. He may have become more determined to solve his problems, or he may have become more hostile. The attitude of the prisoner at the time of the adjustment interview was of great significance in his solving the basic problem which led to his confinement and in appraising his potentialities. The aim of the specialist was to utilize positive attitudes to the advantage of the prisoner where possible, so that he could be in a better position to cope with his problem.

The chief objective of this interview, however, was to determine motivation for service. It consisted of three phases: (1) ascertaining the prisoner's attitude toward confinement, (2) orientation toward authority, and (3) counseling on problems which led to the disciplinary action.

The following general areas were explored during the prisoner's interview:

1. How did he view his offense? How was it avoidable? What would prevent its recurrence?
2. Did he feel his sentence was just?
3. What was his attitude toward confinement? How was he taking it? With whom did he identify?
4. What was his attitude toward parolee status?
5. What was his attitude toward future service?

The prisoner was oriented regarding administrative matters relative to his imprisonment. Implications of various types of

discharges were discussed, and the parolee system was explained. Various available resources which were particularly applicable to the prisoner's offense were explained. In counseling the prisoner, problems were explored which were likely to cause maladjustment, including those at home with parents or family, financial, emotional, and those involving the company and assignment. Implications of problem handling were discussed and additional necessary referrals made to the agency best suited to handle them.

Administrative procedures. For the adjustment interview, it was necessary for the enlisted specialist to:

1. Ensure that all reports obtained or requested from intake were available, including the commanding officer's evaluation, personnel file summary, and collateral information.
2. Obtain shift leader's reports.
3. Refer to the proper agencies any problems, or ensure that action was taken if already referred.
4. Forward pertinent information to the confinement officer to aid him in the final custody classification.
5. Check on status of administrative and other recommendations.
6. Initiate recommendations for processing under the provisions of administrative regulations, if indicated.

CONFINEMENT OFFICER REVIEW

The confinement officer, after studying and evaluating all available information and the evaluations provided by the enlisted specialist, interviewed the prisoner. On the basis of this study and interview, he made decisions regarding the management of the prisoner. He used the evaluative study to aid in classifying the prisoners in the custody believed proper in terms of one of the three degrees of custody classification and made recommendations concerning restoration to duty, clemency and parole, and considered the advisability of recommending administrative separation from the service.

PAROLE PERIOD

In the eventual classification of prisoners into two categories—those identified as potential material for rehabilitation and those considered capable of being rehabilitated satisfactorily—only a small part of this determination was based on the prisoner's apparent motivation, that is, what he said. A similar dichotomic distinction was made of the prisoner population regarding those who did and those who did not identify with or accept authority, both as exemplified by the stockade personnel and the disciplinary limitations placed upon the prisoner, as well as the authoritarian model that resulted from the prisoner's concept of Army authority.

The stockade prisoner sees the Army in a specific light—based upon his experiences in civilian life and in the Army. He has constructed in his own mind a model of what the Army is like and what the stockade is like. Based on these reactions to the Army and to the stockade and on his own unique experiences and needs, he is forced to make a decision as to whether he accepts or rejects the fact that confinement is at least in part justified. His decision is a matter of "I do" or "I don't;" he has to identify either with those who are able to accept necessary discipline or with those who are not.

If identified as capable of responding satisfactorily to efforts of rehabilitation, the prisoner was offered the opportunity of accepting parole. This decision was entirely up to him. He could accept it or reject it. In some cases, prisoners offered this opportunity rejected it because they did not consider themselves ready for parole. Some were undecided. These prisoners, however, subsequently resolved their decision in one way or another.

The parole period was in a sense an intermediary step in the return to duty. Emphasis was on the individual as a soldier instead of as a prisoner.

Parolees were quartered in a comfortable, attractive barracks which had been completely renovated. There were curtains at the windows and each prisoner had a foot locker and a wall locker. During the day the barracks was in charge of a sergeant who acted as a first sergeant in the line. There was roll call each morning and evening and bed check at night. There were no guards as such.

The program for the parolees was more strenuous than in the classified custody area. They arose at 0530 hours and went through a period of calisthenics and drill. At 0630 they were fed, and between 0700 and 0800 were given instructions or further drill. They were assigned jobs in accordance with their military occupational specialty or prior work experience; for example, if a prisoner had been a mechanic in previous jobs or assignments, he was assigned to the post motor pool. They went to their post jobs without guard. While on the job they were under direct supervision of a carefully selected officer or noncommissioned officer who assumed responsibility for reporting the behavior and conduct of the prisoner on a weekly basis. This was a far cry from the routine details that the parolee had been accustomed to in the past. Here the parolee was treated like a soldier.

Upon return to the barracks at 1630 hours, the prisoner was again given a brief period of physical training. Four nights a week he continued his Army education; he attended a 2-hour class in military subjects on each of these evenings. Special

visiting and theater privileges not available to other prisoners also were given.

Violations of any of the privileges usually resulted in removing the prisoner from parolee status, returning him to custody classification, and the possibility of additional punishment. Minor infractions were sometimes handled by the confinement officer with a loss of some of the prisoner's privileges.

INTERVIEW PRIOR TO RELEASE

To bridge the gap between release from confinement and return to duty, a prerelease interview with each prisoner identified as likely to respond satisfactorily to efforts of rehabilitation was conducted by the social work specialist.

The prisoner about to be released has a natural apprehension about going back to duty. He is concerned about the future; he wonders how he will get along, what duties he will have, and, if he has not already solved his problem, whether or not he will be able to do so. In the mental hygiene prerelease interview, the specialist provided information and assurance to the prisoner in this state of apprehension and uncertainty, and aided him in preparing for a satisfactory adjustment to his return to duty. He reviewed the duties and responsibilities of the prisoner and the treatment he was to be afforded following release. He covered such points as change in attitude in confinement, effect of confinement, including court-martial and parolee status on future service, attitude toward future assignment, and resolution of problem areas.

Information had been added and re-evaluations made since the time of intake. For the prerelease interview, the social work specialist rechecked results of prior interviews making sure that:

1. All records were obtained.
2. Interview material was available, such as report of intake, adjustment, and neuropsychiatric report, if any.
3. Problem areas were properly resolved or adequately handled, if possible.
4. Request for reassignment was prepared, if indicated.
5. The commanding officer was notified if impending release and request for interview was made.
6. Conduct during confinement was reviewed and recommendations for possible action, if necessary, were prepared.
7. A letter of merit for the confinement officer's signature was prepared.
8. Requirements for leave were ascertained and a pass or leave requested, if indicated.
9. Assignment was requested.

INTERVIEW WITH OFFICER

Following the prerelease interview, the enlisted specialist, having notified the commanding officer of the impending release of the soldier, talked with him, explaining what had been learned of the assets and deficits of the soldier and provided him with a complete account of all the information and evaluations that had been accumulated. After receiving the information from the enlisted specialist, the commanding officer was better prepared to understand the problem and the current attitude of the soldier and to conduct an interview with the soldier in which both he and the soldier would profit. Through this interview, if necessary, he could then aid the soldier in rehabilitation, picking up where the stockade had left off.

RESULTS

Although there was some apprehension as to the position of screening personnel in relationship to staff and prisoners, they were able to maintain the confidence of both groups. The guards, although suspicious at the beginning, rapidly became enthusiastic about the program and often approached confinement staff, specialists, and members of the consultation service with questions regarding the prisoners or with unsolicited observations of prisoner's behavior.

The number of guards was reduced to about 25 per cent of the original number. In spite of the parolee program the number of escapees remained the same or less. The number of prisoners under maximum custody varied from time to time but was never greater than before the screening procedure. The incidence of attempted suicides or gross psychiatric problems was substantially less. The patient load origination from the stockade to the consultation service was reduced to one half, and emergency calls to the consultation service ceased almost completely.

CONCLUSION

The experience in the evolution of the stockade program generated the following tentative conclusions, although an accurate statistical follow-up study was not possible.

1. The success and acceptance of such a program is enhanced by its gradual evolution and demonstrated value of each step. This allows adequate evaluation of each phase by all concerned and often provides a clue to the next possible development.

2. The advantages of placing the responsibility for the program in the hands of the confinement officer are obvious, but there is a natural disadvantage in that the program is dependent upon the capabilities and enthusiasm of the officer. Fortunately, this risk is, in our experience, minimal because of the increasing

attention given to selecting well-trained, capable officers and the obvious personal and professional advantages of the system.

3. With well-trained, intelligent, well-motivated social work specialists and close professional supervision, the program proved successful with only minimal demands upon the time of the staff of the consultation service.

4. Apart from screening, which seemed to fulfill its purposes most adequately, the program provided an aid to rehabilitation which was voluntary and based on increased responsibility, military training, and increased personal benefit. The soldier was provided with a choice and, because his offense was more often based upon immaturity rather than on antisocial or criminal behavior, he willfully and consciously made a choice that not only was personally profitable, but led the way to his successful reintegration into his duty role as a responsible, effective soldier.

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HABITS vs THEORIES

Is coronary atherosclerosis preventable? At the present time, it is not. Reduction in the percentage of fat content in an American diet and cessation of cigarette smoking might lower somewhat the incidence of this important condition, but it is unlikely that these measures will be practiced on a large scale, for habits have a stronger hold on men than do theories. Effective prophylaxis must await accumulation of basic knowledge relative to the etiopathogenesis of atherosclerosis and coronary disease.—William L. Proudfit: Is Coronary Atherosclerosis Preventable? *Journal of the Iowa State Medical Society*, January 1959.

HERPES SIMPLEX KERATITIS FOLLOWING FEBRILE ILLNESSES

JAMES E. LEIBOLD, *Captain, USAF (MC)*

FOUR patients, seen during the Asian influenza outbreak in Colorado in the fall of 1957, developed herpes simplex (dendritic) keratitis in association with the influenza and in a fifth patient the condition was associated with a common cold. It is hoped that presentation of these cases will make medical officers, other than ophthalmologists, more aware of this disease as a possible complication of a febrile illness. The possibility of this serious ocular disease should be considered in patients who complain of red eyes or "eye irritation" in conjunction with or following attacks of influenza or common cold. Often these ocular complaints are erroneously classified as a "cold in the eye" or as associated conjunctivitis.

The treatment of herpes simplex keratitis is difficult, and the disease can have serious consequences. Severe scarring and vascularization of the cornea can result, with corresponding decrease in visual acuity. If herpes keratitis is properly diagnosed and treated in its earliest phase, these serious sequelae can be minimized. The advantages of early diagnosis and treatment and the difficulties of late therapy are illustrated in the case presentations.

DIAGNOSIS

As this paper is primarily directed to nonophthalmologists, a few points in the diagnosis of herpes simplex keratitis, by means readily available to medical officers, will be outlined. The first sign of dendritic keratitis usually is conjunctival injection and ciliary injection; visual acuity is reduced. Symptoms of pain can vary from a foreign-body sensation to severe pain. The corneal nerve endings are affected by the disease, and often after two or four days the pain subsides and there is a corneal hypesthesia. A secondary iritis is almost always present, and this causes photophobia. In more advanced cases, the corneal ulcers can be seen by oblique illumination, and the epithelial defect will cause a shadow on the iris. They are more easily seen after staining with fluorescin. If the dendritic shape of the ulcer cannot be seen by the naked eye, it can often be seen by

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magnification with a loupe. Slit-lamp microscope findings will not be discussed inasmuch as this method of examination usually only is used by ophthalmologists.

Herpes simplex keratitis can be recurrent, as the virus apparently lies dormant in the corneal epithelium and is activated during febrile illnesses. Herpes simplex can remain latent between attacks with no damage to cells in the quiescent phase.[1] For this reason, careful past history of ocular disease often is helpful in diagnosis.

TREATMENT

Once the diagnosis has been made or suspected, the patient should be referred to an ophthalmologist for treatment. As mentioned earlier, the treatment is difficult and consists in the main of cautery of the ulcers with iodine (3.5 or 7 per cent), trichloroacetic acid, or ether. This chemical cautery kills the cells which harbor the virus. The eye is atropinized to treat the secondary iritis and to put the eye at rest, and a firm dressing is applied.

Smallpox vaccination can be given to build up general immunity. There is no specific herpes simplex vaccine that is successful, and the immune response of the body is rather poor, especially in repeated infections. Hallet, Naib, and Leopold[2] inoculated rabbits with polyvalent influenza virus vaccine both 14 days before the rabbit corneas were infected with herpes simplex and on the first and third days after infection of the cornea. As compared with a control group, they found that this attempt to build up general immunity and lessen the severity of the herpes keratitis was completely unsuccessful.

Formation of antibodies in primary herpetic infections is variable, but there usually is a rise in antibodies in the first infection. In recurrent infections, however, it is seldom possible to detect significant rises in antibody titer; and attempts at immunizing patients have been unsuccessful. The smallpox vaccination often used as part of the treatment of herpes keratitis is, of course, not specific, and there has been no real proof that it is of great value, but it is certainly worth a try.

Cortisone is specifically contraindicated in the active phase of dendritic keratitis and, if used, may cause corneal perforation, uveal-tract involvement, and increased chronicity of the disease.[3] In experimental studies large intramuscular doses of cortisone have caused prolongation of the acute phase of the disease and delay of healing. Systemic as well as local use of cortisone, therefore, is to be avoided.

CASE REPORTS

Case 1. Two days after recovery from Asian influenza a 10-year-old girl's right eye became red and painful and a vesicular rash developed in the right periorbital region. This was diagnosed, in another city,

as impetigo. The skin and eye were treated with cortisone. When seen by me, five days after the onset of the eye involvement, the rash had cleared but there was a typical herpetic ulcer of the cornea. There was severe redness, pain, and photophobia, and visual acuity was decreased. Two years previously, the patient had had a keratitis in the same eye following a febrile illness and associated with a vesicular rash in the periorbital area. It is thought that the "impetigo" was in reality herpes simplex lesions and that cortisone should not have been used in treating the eye. The ulcer cleared after two weeks of treatment, but the resulting scar has impaired the vision to 20/40, as determined by a six-month follow-up.

Case 2. A 25-year-old airman presented himself in the eye clinic with a complaint of a foreign-body sensation in the left eye of 12 hours' duration. Examination revealed photophobia, ciliary injection, and decreased visual acuity, and a typical dendritic ulcer could be seen grossly by oblique illumination of the cornea. Five days previously the patient had been assigned to quarters with a diagnosis of Asian influenza. Two days after the onset of this illness he developed multiple herpes simplex lesions of the upper lip, and the eye involvement followed this by about 48 hours. The ulcer was cauterized with iodine, and the eye was completely clear in 10 days, with no impairment of visual acuity.

Case 3. A 20-year-old youth was placed on quarters with a diagnosis of Asian influenza, and two days later he developed a herpes skin lesion at the left nostril. Forty-eight hours following this, he came to the eye clinic complaining of irritation and redness of the left eye. There was past history of herpes keratitis two years previously, which resulted in scarring and some superficial vascularization of the cornea. Examination revealed a red eye and much photophobia. There were two small, round stained areas of the cornea, typical of a metaherpetic keratitis. This is the form that recurrences of herpes simplex often take. The eye was atropinized and patched, and after seven days was completely clear. Two and one-half months later the patient developed a cold, which was followed by the same ocular symptoms. Treatment was instituted immediately, and the eye cleared in five days.

Case 4. Two days after recovery from Asian influenza, a 19-year-old youth noted redness of both eyes. Twenty-four hours later his eyes had become painful and sensitive to light, and visual acuity was markedly decreased. This was diagnosed as conjunctivitis by a general medical officer and treated with a local antibiotic and anesthetic. Two days later the ophthalmologist was called in consultation, and severe bilateral herpes simplex keratitis was found. The ulcers, which extended almost the entire length of the cornea in the right eye and just to the central portion of the cornea in the left, were cauterized, and the eyes were atropinized and patched. The patient was hospitalized 21 days before the eyes cleared, and the resulting scars caused a decrease in the visual acuity of the right eye. Neovascularization of the scar of the right eye occurred, and six months later the patient

is still under treatment in an attempt to minimize growth of new vessels. In a six-month follow-up this patient had one recurrence of herpes keratitis in the left eye. This was observed three months after the original episode and was in association with a common cold. Treatment was instituted immediately this time, and the eye was clear in five days, with no further impairment of visual acuity.

Case 5. A 9-year-old girl developed a cold and fever, and two days later the left eye was red, painful, and sensitive to light. The pediatric clinic diagnosed the condition as conjunctivitis. A cortisone-antibiotic ophthalmic ointment was prescribed, and in three days the eye was no longer painful but remained red and sensitive to light. Ten days later the patient was seen by the ophthalmologist, and the visual acuity was less than 20/200. There was no pain, as the corneal sensitivity was markedly reduced because of the large dendritic ulcer. The ulcer had to be cauterized three times, and the eye did not clear until 50 days after the onset of symptoms. The scar is vascularizing, and the distant vision was 20/40. Six months later the eye again became slightly red and painful. Immediate examination revealed a small ulcer on the old scar. This recurrence was treated conservatively by patching and dilatation, and the ulcer cleared in five days. Vision is now 20/70.

DISCUSSION

Cases 1, 4, and 5 illustrate the long, chronic course and serious complications of the disease when diagnosis and treatment are delayed. Cases 2 and 3 point out the relatively short course and lack of sequelae when early diagnosis and treatment are instituted. In three cases a recurrence of the disease was seen in a six-month follow-up, and two were associated with minor febrile illnesses while one was not. The importance of taking a past history regarding ocular diseases when diagnosing a red eye is illustrated by the case histories and follow-up studies.

SUMMARY

Injection, reduction of vision, pain and photophobia of an eye should make one suspicious of herpes keratitis in patients with febrile illnesses. Contrast between sequelae of three cases in which diagnosis and treatment were delayed and in two cases where early therapy was instituted, is demonstrated.

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PREVENTION AND CONTROL OF RABIES IN KOREA

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LEE JUNG JAI, *D. V. M.*

FOUR soldiers and one civilian employee in Korea were bitten during April 1958 by stray civilian-owned rabid dogs, which had entered or been near military compounds. From May 1957 to May 1958, 19 military personnel were bitten by infected animals, and a total of nine apprehended dogs were proved by the laboratory to be rabid. In all cases the victims received phenolized rabies vaccine without incident.

Because rabies is primarily a disease of animals transmissible to man by the bite of an infected animal, Veterinary Service of the U. S. Army performs an integral part in the prevention and control program, especially in and around military installations. The senior veterinarian assigned to the Eighth Army in Korea functions as a staff member and is advisory to the Surgeon on animal diseases transmissible to man. All policies, publications, and procedures implemented are approved and directed by the Eighth Army Surgeon before any positive action can be taken.

In a foreign country it is imperative that close liaison be maintained between the Army Veterinary Service and preventive medicine representatives of the local government, in order that the military may be advised of the identity, prevalence, and location of existing animal diseases transmissible to man.

The Veterinary Section of the Livestock Bureau, a division of the Ministry of Agriculture in Korea, is responsible for animal disease control and the compilation of statistics. The information in table 1 assisted military authorities in the formulation of the rabies control program.

The number of rabid dogs listed in table 1 should probably be doubled, because many animals that die of rabies are not reported or submitted for laboratory diagnosis. The civilian dog population in Korea is increasing very rapidly without a corresponding increase in the number of animals vaccinated.

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In addition, registration, licensing, and leashing of animals is not required. An increase in the incidence of rabies, therefore, is to be expected.

TABLE 1. *Dog population, vaccination, and incidence of canine rabies in Korea, 1950-1958*

Year	Dogs		
	Total number	Number vaccinated	Known rabid
1950	-	2,260	32
1951	-	14,750	23
1952	-	18,389	65
1953	-	69,980	31
1954	238,539	142,258	77
1955	249,926	18,907	9
1956	320,524	63,013	9
1957	380,912	19,608	21
1958	455,379	223,531	38*

*To 30 April 1958.

Laws do not require that cases of rabies in humans be reported and therefore the number of human cases cannot be ascertained with certainty. It has been unofficially reported by the Chief of the Preventive Medicine Section, Ministry of Health, Seoul, however, that at least five persons died of rabies in Korea, in 1957, and over 9,000 persons received the anti-rabies treatment.

CIVILIAN AND MILITARY CONTROL EFFORTS

In 1930, the Korean Government adopted Preventive Law No. 6, titled "Animal Infectious Diseases," which recognized rabies as a disease of public health significance. This law authorizes the governors of each of the six provinces to delegate authority to the police and civilian veterinarians to quarantine animals, kill rabies suspects, and eliminate stray dogs if deemed necessary. Each provincial veterinarian also is responsible for reporting cases to the Veterinary Division, Livestock Bureau, Ministry of Agriculture.

The Korean Government maintains two national laboratories which prepare animal vaccine and perform laboratory diagnostic work. Seoul University and six agricultural colleges offer four-year courses, with each school graduating about thirty veterinarians annually. At present there are 933 practicing, licensed veterinarians in Korea for a population of 22,000,000 people.

Inasmuch as most military installations are located in and around cities and villages, military personnel frequently come in contact with civilian-owned animals, both on and off military compounds. For this reason, it has become increasingly apparent

that the Korean Government must institute an effective rabies control program to eliminate the threat to military personnel. To facilitate and encourage such a program, the following steps were taken:

1. The veterinary section of the Livestock Bureau, Ministry of Agriculture, was advised by the U. S. Eighth Army Veterinarian, Korea, of the number of rabies cases diagnosed by the military. The veterinary section agreed to implement a free-vaccination and registration system for all privately owned dogs. The chief of the Livestock Bureau called a meeting of provincial veterinarians, police representatives, and military and Office of the Economic Co-ordinator veterinarians, at which time plans were formulated to vaccinate and register as many civilian-owned dogs as possible to ward off a possible epizootic.

2. The veterinarian in the Office of the Economic Co-ordinator was requested to lend assistance to the Korean Government in an effective rabies control program. They responded by donating 13,000 doses of stateside-prepared animal vaccine, and the National Laboratory in Pusan began preparation of an additional 700,000 ml of vaccine. The mass inoculation of animals commenced on 15 May 1958. Each animal owner is given a tag and a registration certificate at the time the dog is vaccinated. The program is now in progress and the response of dog owners has been surprisingly good. It is hoped that at least 70 per cent of the dogs in Korea will be vaccinated and tagged.

3. The Preventive Medicine Section of the Ministry of Health was contacted and it was agreed that whenever the military has knowledge of Korean civilians being bitten or exposed to a rabid animal, all the facts pertaining to the incident will be made known to their office so that rabies vaccine can be released for all bitten persons.

4. Whenever a rabid dog is apprehended by military personnel in a town or village, the police and mayor are contacted so that the information can be publicized locally. Any civilian bitten by the rabid dog will be requested by civil authorities to report at once for treatment.

To prevent the spread of rabies in animals on Army installations, Eighth Army Circular, No. 40-940, "Prevention and Control of Rabies," dated 5 March 1958, was published, requiring the following protective measures:

1. All animal pets, except fish and birds, maintained on military reservations are to be vaccinated annually, registered with the Provost Marshal, and must wear a vaccination tag.

2. No rodent pets, such as chipmunks or rats, are allowed as animal pets because they may carry the rabies virus. Anyone bitten must take the antirabic treatment if the rodent escapes and is not available for quarantine.

3. All strays on a reservation must be picked up by the military police. Any animal not wearing a vaccination tag is considered a stray ownerless dog.

4. Animals must be kept under the direct control of the owner at all times.

5. Any individual bitten is required to report to the nearest medical facility for wound treatment and referred to the antirabies board. (This board, which consists of a veterinary officer and three medical officers, convenes and all factors concerning the case are discussed. The veterinarian contributes information to the board concerning the physical condition of the suspected animal, the incidence of rabies, and an opinion as to whether or not the bitten person should receive the rabies vaccine. The animal suspect, if available, is given a physical examination and is quarantined in isolation kennels for 14 days. In the event the suspected animal cannot be found or is showing symptoms of rabies, the person must take the rabies vaccine.)

Within the Eighth U. S. Army Korea, one of the major problems is the education of the soldier concerning the danger of rabies. To accomplish this, precautionary warnings are made on the radio, notices are put in the daily bulletins of each area command, and at staff and commanders' meetings emphasis is placed on the provisions of Circular 40-940, "The Prevention and Control of Rabies," which should be complied with.

CASE REPORTS

Case 1. A stray dog wandered into the 76th Engineers' compound and was teased by a soldier and a Korean houseboy—both were bitten. The Military Police apprehended the animal and brought it to the Veterinary Clinic. Physical examination showed the dog to be vicious and clinical symptoms of rabies were present. The animal was placed in quarantine and soon showed symptoms of hypersensitivity and a partial posterior paralysis; death occurred within 24 hours. The Veterinary Officer removed the head, packed it in dry ice, and sent it by air to the 406th Medical General Laboratory, Camp Zama, Japan, for diagnosis. The tests proved positive. Both individuals received the antirabic treatment without incident.

Case 2. In May 1957 a four-month-old pup, a company pet on a South Korean air base, became rabid and, during a three-day period, bit 14 airmen and one civilian before it was suspected the dog might be rabid. The animal died on the fourth day and Negri bodies were found in the brain, which are conclusive of rabies. All bitten persons received the antirabic treatment without incident.

Of interest is the fact that 90 per cent of the persons bitten by rabid dogs were playing with, teasing, chasing, examining or otherwise tampering with the animals. If military personnel would avoid stray dogs, nearly all cases of exposure to rabid animals could be eliminated.

AN IMPROVED METHOD OF OBTAINING DONOR BLOOD FOR EXPERIMENTAL HEART-LUNG MACHINES

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IN the latter part of 1957, the Surgeon General at the direction of the United States Air Force designated the U. S. Air Force Cardiovascular Research Center to be set up at this base. One of the projects undertaken was the study, evaluation, development, and improvement of various heart-lung machines, including those in current use, that might be used in open cardiac surgery. Being a pioneering development in the Air Force, many problems were encountered. Among initial difficulties were those associated with the collection of blood for priming the heart-lung apparatus. It was found to be a time consuming process and required several persons to carry out each procedure.

At the onset of our experimentations in the use of a heart-lung apparatus, blood was collected via the femoral arteries of donor dogs. This required dissection and cannulation of the vessels. It proved to be an uneconomical procedure from the standpoint of time required, averaging about 45 minutes per dog. Various factors such as clotting within tubing and difficulty in cannulation often further increased the time per procedure. We were, therefore, prompted to devise a different technic for collecting donor blood. After experimenting with various methods, in an attempt to ascertain which was the most satisfactory, we were led to adopt an intracardiac route utilizing a table of special design. Details are elaborated further on in the text.

The advantages of our method are: 1. One person can collect the blood. 2. No dissection is necessary. 3. No surgical operation is involved. 4. It has been found possible to decrease the amount of anticoagulant used. 5. There is less trauma to blood elements. 6. It is less time consuming than other methods. 7. It

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can be performed by personnel with minimum amount of training. 8. A minimum of equipment is necessary. 9. The amount of blood obtained most closely approximates the total calculated blood volume of the particular animal being bled when compared with other methods of obtaining blood.

MATERIALS AND METHOD

Items necessary include a needle and syringe containing the anesthetic to be administered intravenously; several siliconized, 4½-inch, 13-gage needles; graduated plastic container,* and a table. Siliconization of the needles has been found to be important from two aspects. First, this helps to minimize the trauma to blood elements. Second, the number of needle replacements,

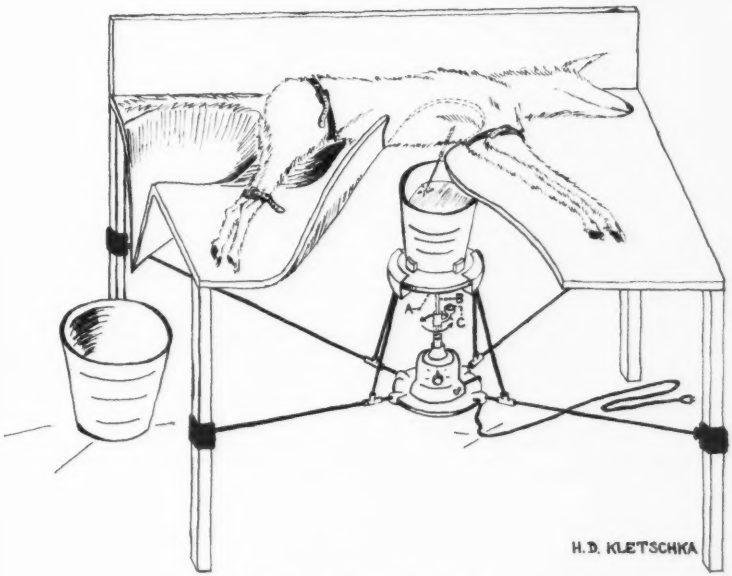

Figure 1. The table in use.

necessitated by clotting during the bleeding procedures, is reduced. The table used for bleeding may be modified according to individual desires. For sake of simplicity, for example, two tables may be used to hold the dog. The tables are placed together with the dog lying on both. They are then separated so that only the left chest, facing downward, is accessible to the receptacle used for collecting the blood. For maximum advantages, however, we suggest a table patterned after the one semischematically depicted in figure 1.

*We have used one made of polyethylene.

In actually carrying out the bleeding procedure, the dog is first anesthetized and weighed. A gross calculation of the blood volume is then made. The animal is placed on its left side on the table and strapped down so that movement during the procedure is prevented. The straps for the table illustrated in figure 1 are so constructed that they can be adjusted to accommodate and secure a dog of any size.

The amount of anesthetic used for each animal is kept at a minimum. Some, of course, is maintained within the donor animal, but an undetermined amount remains in the blood stream and is collected in the pooled blood. This is recirculated in the operated animal and its effect may be deleterious to the outcome of the procedure. This however, applies only to the animal laboratory and need not be considered during clinical use.

The point of maximum impulse is palpated in the left chest wall and the 13-gage needle is inserted directly into this area. The left ventricle should be entered at this point, and a pulsatile stream with bright red blood indicates that the needle is in the proper location. The stream is directed into the plastic receptacle, which has been appropriately sterilized and contains the heparin used to prevent coagulation.[1]

If the stream slows down, it may be necessary to insert a clean needle because of clotting within, or dislodging of, the previously inserted needle. It is important that the needle be held steady to decrease trauma and avoid dislodging. The needle is kept in place until the maximum amount of blood is obtained. This will be obvious by cessation of respirations, cessation of flow, and absence of heart beat.

While blood is being drawn, the flask is continuously and gently agitated to promote admixing of blood with the anticoagulant. This may be done manually or some type of mechanical device may be used such as that shown in figure 1. After the required amount of blood for priming the heart-lung apparatus is obtained, it is immediately added to the apparatus and circulated gently.

We studied our method, comparing it to other technics for obtaining donor blood. For this study, 72 dogs were utilized. The findings are summarized in table 1.

From this data, it is evident that most complete bleeding occurs with the use of the direct intracardiac method. At first glance, it is not apparent why a larger yield is obtained by this method than by direct bleeding from the transected descending aorta. We believe this is due to the slower exsanguination which occurs when the intracardiac needle is used, allowing for peripheral readjustments to occur, thereby permitting a continued and more complete

blood return to the heart. The exsanguination accompanying transection of the descending aorta is so acute that these accommodative mechanisms do not have time to come into play. Probably this also accounts for the observation that in attempting to hasten the bleeding using the intracardiac method by applying suction to the needle, the volume yield of blood decreased. Although, by the transected descending aortic technic, the actual bleeding

TABLE 1. *Comparison of time consumed and yield of blood obtained by various exsanguination methods*

Source of donor blood	Average time consumed (minutes)	Average amount of blood obtained per dog (ml/kg)
Femoral artery	45	65
Descending aorta (complete transection and direct bleeding)	30	50
Intracardiac needle (see text)	20	75

is completed more rapidly, the procedure necessitates a more elaborate surgical setup, consists of a more formidable surgical procedure (adding time to the procedure which is not compensated for by the more rapid exsanguination), requires more personnel (in our experience, a minimum of three persons), and is technically more difficult to carry out.

SUMMARY

An expedient and improved method for obtaining donor blood as used in heart-lung machines in the experimental laboratory has been described. By use of a specialized table and adopting a method of obtaining blood through an intracardiac route, it has been possible to get larger volume yields of blood per animal and to economize on materials, time, and personnel to a degree unobtainable by other methods. Technics, findings, and advantages are discussed.

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AN EPIDEMIOLOGICAL STUDY OF AN OUTBREAK OF WATER-BORNE DYSENTERY

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IN order to appreciate some of the problems encountered by U. S. Forces in Germany, one must realize the relationship which exists between the U. S. Forces and the German State. When Germany was entered and occupied as an enemy power, certain obligations were imposed upon the various levels of German government. One of these pertained to water supplies. In areas where troop concentrations warranted it, the German municipalities were required to provide an acceptable water supply according to U. S. standards. This imposed definite requirements on source construction, protection, and treatment to include chlorination. In addition, Army personnel were entitled to survey and visit any or all portions of the water supply and distribution systems. Thus, up-to-date knowledge was always available about the status of those supplies.

However, in May of 1955, Western Germany was granted her sovereignty and became part of the NATO family. With the granting of sovereignty, the status of the U. S. Forces changed to the position of visitors in an allied nation. However, the two federal governments agreed that the various municipalities must continue to provide U. S. installations with "potable water." Unfortunately, no details were set forth as to what constitutes a potable water. Thus, an issue was created in certain areas due to the German belief that "potable water" merely means that water must be bacteriologically safe and that protective measures, type of treatment, and operation are not to be considered as elements in defining water quality.

On the basis of this reasoning many communities discontinued chlorination or carried it on in a haphazard manner. On the other hand, it was the view of the U. S. Forces that it is not sufficient to depend upon the examination of a few bacteriological samples and that source protection and chlorination were still required.

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Because of this difference of interpretation, where chlorination was continued it was only continued due to the good working relationship between the local U. S. Forces and the local municipality. This situation also applied to surveys of the systems by military personnel. In most instances, the municipalities still permitted sanitary engineers of the medical service to survey the civilian water system, but it was their prerogative to decide what would be done with any recommendations which might be made. It must be said, however, that the city officials usually gave such recommendations every consideration, with the exception of recommendations concerning chlorination.

The basic difference between American and German opinions hinges on the need for chlorination as a protective measure regardless of the original quality of the water. American opinion favors this protection, but Germans feel that water need be chlorinated only if it is proved to be contaminated, and even then they feel it necessary to carry a residual throughout the system. In order to improve German-American relations, the U. S. Forces instituted a program designed to provide its own chlorination at all major U. S. installations. The intention was to relieve municipalities of this responsibility as rapidly as was feasible. Such was the status at the time of the outbreak.

During the period April 23 to May 1, 1956, an outbreak of dysentery occurred at Panzer Kaserne, located at the edge of the city of Boeblingen, which contains troop and dependent housing. Chief complaints were abdominal cramps and colicky pain of 24 to 36 hours duration followed by diarrhea with 10 to 18 watery stools daily. The outbreak involved military personnel and their dependents living in the Panzer Kaserne area, dependent school children who lived in other housing areas and attended school at the Kaserne, and men assigned to the Kaserne for work but living elsewhere. It was interesting to note that the parents of children attending the Panzer Kaserne School but living in other housing areas did not acquire the disease. This incidence distribution showed that the outbreak was confined to personnel living or working at Panzer Kaserne. First notification of the outbreak was received late on April 25, 1956, when 65 cases were reported.

EPIDEMIOLOGICAL DATA

Preventive medicine personnel are called upon to investigate water-borne epidemics at such infrequent intervals that there are few who can claim any great experience in this field. Consequently, detailed information of such outbreaks is of more than ordinary interest. The first day, 8 men reported to sick call with what was diagnosed as gastroenteritis, the second day there were 16, and the third day 41. It was at this time that the authors were first notified.

A preliminary investigation carried out shortly after notification was received revealed sufficient information to cast suspicion upon food or water as being the causative agent. Based upon these observations, stools and vomitus, plus samples of food eaten at previous meals, were collected and sent to the laboratory at the U. S. Army Hospital, Bad Cannstatt. Good epidemiological evidence could have been supplied by laboratory examinations for a number of infective agents, and a study of paired sera. It was unfortunate, however, that the laboratory requests for stool examinations made out by the attending physician requested examination only for ova and parasites, not for bacteria or viruses. Thus, the stool specimens were of little value and, as could be expected, the results of laboratory examinations were negative. Tests for Salmonella-type organisms performed on food samples also proved negative.

Detailed investigation of the source and distribution of food and milk consumed was accomplished in order to determine the possibility of their being involved in the epidemic. In Germany, the U. S. Army provides food shopping facilities through Quartermaster commissaries. Each commissary is normally located in a center of population and serves all the American families in that area. In the vicinity of Boeblingen, there are three commissaries, one located in Ludwigsburg and two in Stuttgart. Foodstuffs for all three commissaries were broken down at one central point (Osterholz breakdown point, Ludwigsburg) and then sent to the various commissaries. Dependent personnel living at Panzer Kaserne purchased all foodstuffs from the commissary located at Kelley Barracks, Stuttgart. This was with the exception of some food purchased in local markets; however, there was no correlation between these foods, or any given food or vendor, and the epidemic. The Kelley Barracks Commissary also served personnel living in Boeblingen, Sindelfingen, Kelley Barracks (Stuttgart), Patch Barracks (Stuttgart), and the communities of Vaihingen, Sonnenberg, and Moehringen (all in the southwest part of Stuttgart).

No cases were reported from any of these other areas, with the exception of children who attended school at Panzer Kaserne and personnel who worked at Panzer Kaserne (see figure 1).

The troop rations were broken down at the Seventh U. S. Army ration breakdown point (Ludwigsburg), with the exception of milk, which was broken down at the railhead in Ludwigsburg. All Seventh U. S. Army units located in the Stuttgart area picked up milk and rations from these points and no cases were reported from troop units other than those stationed at Panzer Kaserne. Food-handling practices in the breakdown method were considered satisfactory and it was felt that they played no part in this outbreak.

At the same time that items of subsistence and food-handling factors were being checked upon, a study was made of the water supply. All water for Panzer Kaserne comes from the municipal supply for the city of Boeblingen. This supply provides water to approximately 18,400 Germans plus 3,500 U. S. personnel

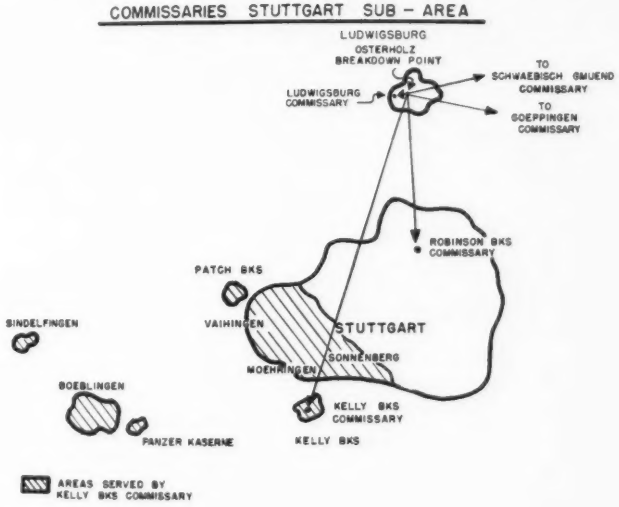

Figure 1. Commissary in the Stuttgart area and areas served by the Kelley Barracks Commissary.

in Panzer Kaserne. There were also approximately 30 U. S. dependents living on the economy in the city. All water for Boeblingen is derived from three sources: The Aidlingen, the E-Work, and the Ammertal Schoenbuch Gruppe (relative locations of these sources can be seen in figure 2).

At the time of this outbreak, all water received by Panzer Kaserne was coming from the E-Work source. For that reason, the investigation centered around this source and its distribution system. However, the other sources were also surveyed and no conditions were found which would implicate them in the outbreak under consideration. Water for the E-Work is derived from a well, a series of springs, and an infiltration gallery, all of which are located on the southeast edge of Boeblingen.

Water from all springs flows to the infiltration gallery, which is approximately 250 meters long, 6 meters deep, and constructed of 300 mm diameter perforated clay pipe. Located at 50-meter intervals are six inspection shafts and all water from the springs flows through the gallery to the final inspection shaft. From this shaft the water flows by gravity to a 600-cubic meter reser-

voir located under the E-Work pump station, from which it is normally pumped to a 1,200-cubic meter reservoir serving the Panzer Kaserne area of Boeblingen (see figure 3). The well water is pumped directly to the 600-cubic meter reservoir and

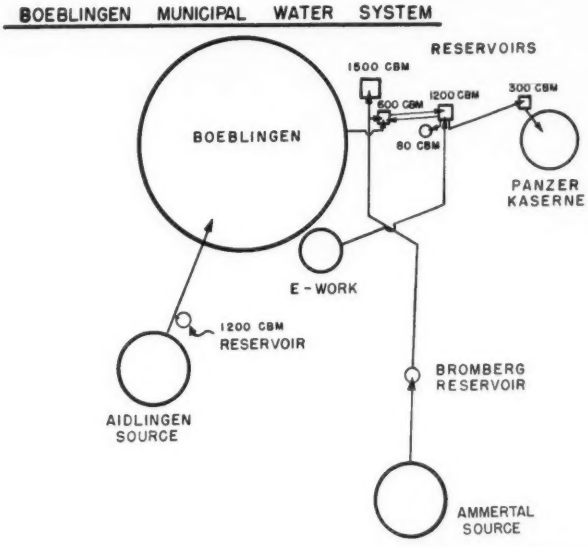

Figure 2. Boeblingen municipal water sources and reservoirs.

does not enter the final inspection shaft. There are three lines entering the final inspection shaft: one brings water from the springs and the gallery; one takes the water to the 600-cubic meter reservoir; the third, which is valved, acts as an overflow in the event of a high water table.

In the course of the inspection on April 26, 1956, it was found that approximately 20 feet from the shaft a trench had been dug for the installation of a water line from the Aidlingen water source to the E-Work reservoir and that during the digging of this trench the overflow pipe had been cut and a section removed. The construction trench intersected a stream which was heavily laden with sewage. This stream was located parallel to and approximately 100 feet from the infiltration gallery and the stream water had flowed into the trench (see figure 4).

At the time of the visit, the broken end of the overflow pipe was partially submerged in the trench water and obvious liquid flow was noted dripping into the shaft from around the overflow pipe where it entered the shaft (see figure 5). The water level in the construction trench was found to be at a higher elevation than the invert of the overflow line where it left the inspection shaft. The ground in this area was apparently saturated with

sewage and the trench water was probably flowing along the outside of the overflow pipe, rather than entering through the closed overflow valve. Samples of the trench water, the shaft water, and the water dripping into the shaft were collected at

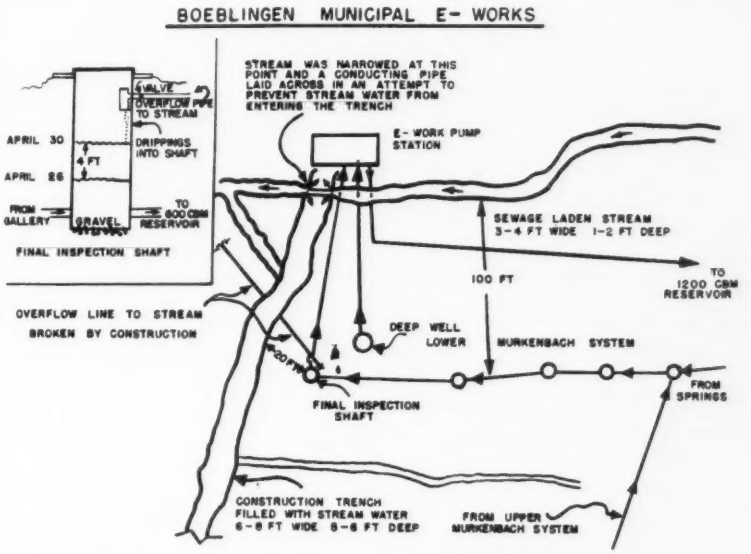
BOEBLINGEN MUNICIPAL E- WORKS
STREAM WAS NARROWED AT THIS POINT AND A CONDUCTING PIPE LAID ACROSS IN AN ATTEMPT TO PREVENT STREAM WATER FROM ENTERING THE TRENCH
VALVE
OVERFLOW PIPE TO STREAM
APRIL 30
DRIPPINGS INTO SHAFT
4 FT
APRIL 26
FROM GALLERY
GRAVEL
TO 600 CBM RESERVOIR
FINAL INSPECTION SHAFT
E- WORK PUMP STATION
SEWAGE LADEN STREAM 3-4 FT WIDE 1-2 FT DEEP
100 FT
TO 1200 CBM RESERVOIR
OVERFLOW LINE TO STREAM BROKEN BY CONSTRUCTION
DEEP WELL LOWER MURKENBACH SYSTEM
200 FT
FROM SPRINGS
FINAL INSPECTION SHAFT
CONSTRUCTION TRENCH FILLED WITH STREAM WATER 6-8 FT WIDE 5-6 FT DEEP
FROM UPPER MURKENBACH SYSTEM

Figure 3. Final inspection shaft and line of other inspection shafts on gallery.

this time. The bacterial examination showed evidence of gross fecal contamination in all three waters. Owing to rainfall during the week prior to April 22, the water level in the trench had at one time completely submerged the broken end of the overflow pipe. This conclusion was based upon a well-established high water line on the side of the trench.

The E-Work well is located on the same side of the stream as the infiltration gallery but is approximately 70 feet from the stream. Water is pumped from the well directly to the 600-cubic meter reservoir beneath the pump station. Samples of this water, which were collected for bacteriological analysis, were negative for coliform organisms.

Chlorination at the E-Work was accomplished by a manually controlled gas, solution-feed, 400 gm/hr chlorinator. On April 26, chlorine was being fed at a rate of approximately 2.2 ppm and the free chlorine residual at the plant was 2.0 ppm. No scales were provided for weighing the chlorine and the cylinder is changed only when the cylinder pressure falls by reason of complete exhaustion of the contents. Municipal officials agreed to increase the chlorine dosage to approximately 3.5 ppm, which

is the maximum capacity of the chlorinator. No records pertaining to chlorination were maintained at this pump station. Such records could have been of considerable value in this instance, as it was believed that on the actual days of outbreak (April

Figure 4. Newly excavated Aidlingen trench, with E-Works in background.

21-22, 1956), the flow of contaminated water into the inspection shaft could have been such as to create a chlorine demand in excess of the chlorine dosages.

The plausibility of this theory was confirmed on April 30, 1956; on this date chlorine was being fed at a rate of 3.5 ppm. The free chlorine residual at a point shortly following the point of dosage (approximately 2 seconds later) was 1.0 ppm, indicating an immediate high chlorine demand, and there was no detectable residual when the water arrived at the 1,200-cubic meter reservoir serving the Panzer Kaserne area (approximately 44 minutes later). Rain had fallen for several days before April 30, lending further credence to the hypothesis that heavy contamination of the E-Work source occurred under very similar circumstances about April 21 or 22.

On April 30, the end of the overflow pipe was again partially submerged, a much heavier flow was noted seeping into the final inspection shaft, and the water level in this shaft was four feet higher than on April 26, 1956. At this time, the Boeblingen municipal officials, in consideration of these facts, agreed to discontinue the use of the E-Work source. On May 1, 1956, Panzer

Kaserne started to receive water from the Ammertal Schoenbuch Gruppe and also from the Aidlingen source.

Prior to this outbreak, when the water arrived at the 1,200-cubic meter reservoir, it was rechlorinated by personnel working for the local Army Area Engineer Office. Chlorination facilities

Figure 5. Final inspection shaft, where sewage entered the system.

consisted of two dripcrocks which were normally operated between the hours of 0830 and 2100 and not operated at all on Sundays or holidays. These crocks dripped a 300 ppm chlorine solution into the reservoir at a rate which the operator "thought was about right," but no attempt was made to verify this "thought." On Saturday, April 21, 1956, chlorination stopped at approximately 1545 hours, when the feed solution ran out, and was not reinstituted until approximately 0930 hours, Monday, April 23, 1956. No records pertaining to chlorination were maintained at this chlorination point. Of the 1,600 cubic meters of water received daily at this reservoir, approximately 1,200 cubic meters went to Panzer Kaserne and 400 cubic meters went to parts of Boeblingen in the same general area. From the reservoir, Panzer Kaserne water is pumped to a 300 cubic meter elevated tank at the Kaserne, from which there is a gravity flow to the distribution system.

STATISTICAL DATA

The total number of cases involved in this outbreak (905) included 346 military personnel, 321 nonschool-age dependents, and 238 dependent children attending school at the Kaserne. The peak for military personnel was reached on the fifth day, during which 186 cases were reported (figure 6).

The peak for dependents and dependent school children was the same as for the military personnel and coincided with the

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incubation period of the disease. Of the total military cases, six were hospitalized with signs of dehydration and appearance of blood and mucus in their stools. A slight rise in temperature

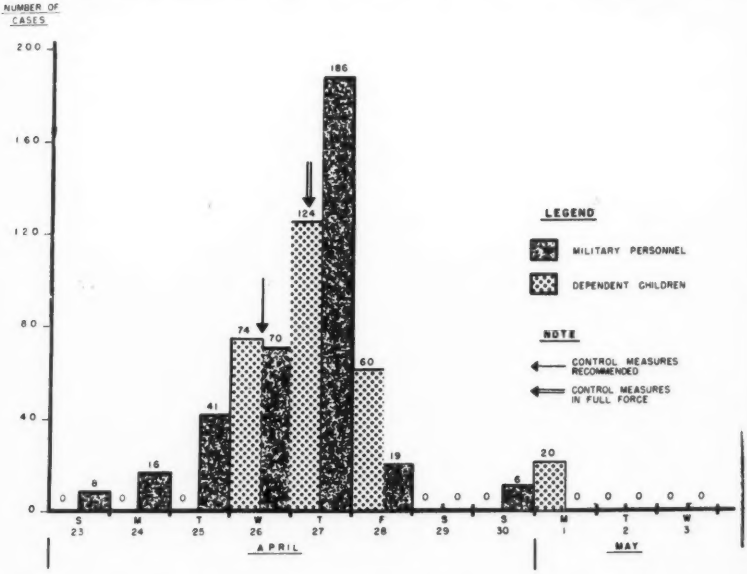

Figure 6. Daily incidence of dysentery for military personnel and school-age children.

was noted in 50 per cent (99° to 100°F), but the most common complaint was abdominal pain and loose, watery stools (figure 7).

BACTERIOLOGICAL DATA

It was interesting to note that no cases were reported among the German population using water from the E-Works source. It is believed that this was due to the following factors: A smaller population was exposed, less water is consumed by German civilians for drinking purposes, such individuals may have a higher acquired immunity to the disease agent involved, and mild cases of diarrhea are not considered important enough to report or to seek medical attention. Diarrhea is not a reportable illness in Germany and no systematic search was made for for civilian cases at the time of the outbreak described.

A call made to the 4th Medical Laboratory, Landstuhl Army Medical Center, for laboratory assistance was met with prompt action. The mobile laboratory, with two laboratory officers and three clinicians, arrived at Panzer Kaserne within 48 hours and immediately set up shop. Rectal swabs were taken on all acute

or convalescent cases and blood was taken from the more seriously ill patients for research and studies. Analysis of the swabs revealed no enteric pathogens and the research studies did not

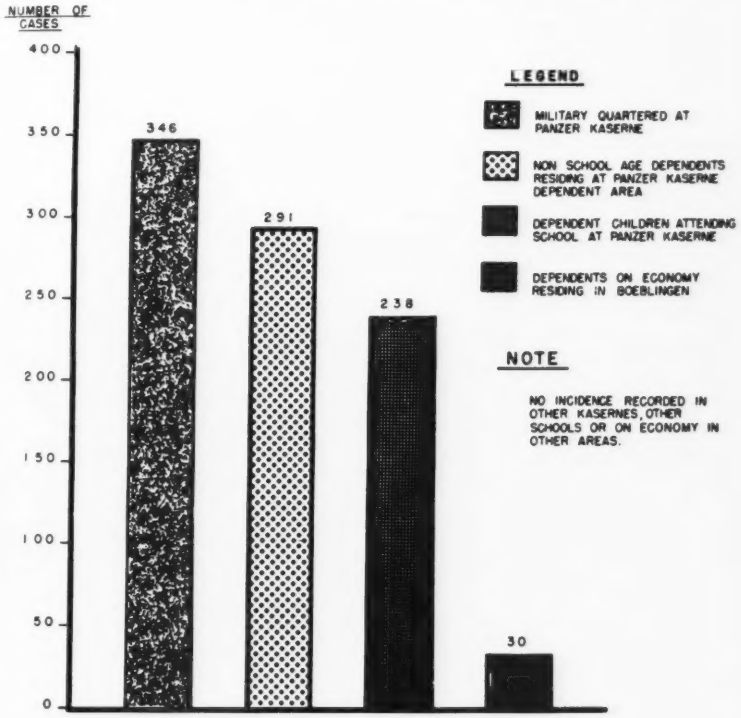

Figure 7. Comparative incidence of dysentery.

shed any new light. All patients recovered uneventfully. No cases of viral hepatitis occurred, although it was feared that that this might be a secondary complication.

Samples of water that were taken from the E-Works for bacteriological analysis showed evidence of gross fecal contamination as shown in table 1.

As can be seen, the water supply was heavily contaminated. Gas production ranged from 25 to 60 per cent in 24 hours and from 30 to 95 per cent in 48 hours. This further pinpointed the sources of the outbreak at the E-Works water source.

It is interesting to note the pattern which occurred later at the well and the final inspection shaft. The well showed contamination only once, whereas the shaft continued to show intermittent contamination. In all probability, the ground around the

TABLE 1.

Date	Location		Results
4/26/56	E-Works	Final inspection shaft	All positive portions, E.coli
"	"	Drippings into final inspection shaft	All positive portions, E.coli and Aerobacters
"	"	Trench adjacent to final inspection shaft	All positive portions, E.coli
4/27/56	"	Final inspection shaft	" " " "
"	"	Drippings into shaft	All positive portions, E.coli and Aerobacters
"	"	Drippings into final inspection shaft	All positive portions, E.coli and Aerobacters
4/30/56	"	Final inspection shaft	All positive portions, E.coli
"	"	Drippings into final inspection shaft	" " " "
"	"	Well	No positive portions
7/12/56	"	Well	One positive portion, E.coli
"	"	Final inspection shaft	All positive portions, E.coli
7/13/56	"	Final inspection shaft	" " " "
7/19/56	"	Well	No positive portions
"	"	Final inspection shaft	" " "
7/24/56	"	Well	" " "
"	"	Final inspection shaft	" " "
7/25/56	"	Well	All positive portions, E.coli
7/31/56	"	Final inspection shaft	No positive portions
"	"	Well	" " "
8/1/56	"	Well	" " "
"	"	Final inspection shaft	" " "
8/2/56	"	Well	" " "
"	"	Final inspection shaft	" " "
8/9/56	"	Well	" " "
"	"	Final inspection shaft	All positive portions, E.coli
8/16/56	"	Well	No positive portions
"	"	Final inspection shaft	All positive portions, E.coli

shaft had become so saturated with the grossly contaminated trench water that four months later it still yielded polluted water. Although not included in this report, later samples were collected and intermittent contamination was still being picked up a year later. Once an area is saturated as it was in this instance, it is extremely difficult to tell how long it will take before all the contamination is leached out.

CONTROL MEASURES

As soon as it became evident that the Kaserne water supply was the causative agent of the outbreak the following control measures were instituted:

1. All water for drinking or cooking purposes in dependent areas was boiled for a minimum of one minute.

2. Lyster bags, with adequately chlorinated water, were located throughout the Kaserne.

3. Individual water disinfection was instituted utilizing canteens and water-purification tablets. All men were required to wear their canteens, filled with treated water, while in the field or at work.

4. All individuals exhibiting symptoms, no matter how mild, were encouraged to attend sick call.

5. All food handlers with diarrhea were temporarily excused from performing their normal duties.

6. A search was made for the detection of possible carriers.

The application of control measures by the troops was initially hampered by the fact that troop units had quantities of obsolete supplies for water treatment and did not have adequate supplies of calcium hypochlorite ampules. Personnel also displayed a lack of knowledge about proper use of water treatment chemicals. However, adequate supplies were soon made available and the program proceeded in an excellent manner. Once the control program was in effect, no new cases were reported.

COOPERATION WITH GERMAN PUBLIC HEALTH AUTHORITIES

The cooperation between U. S. Army and German health officials was excellent, once the German officials were convinced that the dysentery outbreak was due to contaminated water from the E-Works. German health authorities declared the water at this source nonpotable and directed that its use be discontinued. As an interim measure, water from the Ammertal Schoenbuch Gruppe and from the Aidlingen source was then provided to the Kaserne.

The Ammertal Schoenbuch Gruppe water was not chlorinated, so that the resulting mixed water had a negligible chlorine residual. This water was therefore rechlorinated (at a dosage of

2.0 ppm) at the 1,200-cubic meter reservoir on a 24-hour basis utilizing the existing drip crocks. In addition, emergency water discipline at the Kaserne and dependent housing area was still maintained.

DISCUSSION

During the course of this investigation, a number of instances were noted where extremely poor judgment was exercised and poor procedures were in use. Among these may be noted the following:

1. Municipal engineering personnel realized that they were working in a water supply area and still did not observe good engineering practices when they excavated the trench. This permitted the cutting of the overflow line and flooding by the sewage-laden stream. Even after this happened no attempt was made to correct the situation. In fact, they stated their intention of leaving the sewage-laden water in the trench until after the new water line had been laid, in order to detect line leaks by the air bubbles which would rise to the surface. This was actually permitted and as a result, the new line was contaminated. The proper procedure for detecting leaks in new mains is to test the mains at high water pressures and visibly note where leakage occurs. When changes or repairs are made on a water works, they must be made with the greatest of caution. If they are not, they can be made in such a way as to endanger gravely the lives of personnel using the system.

2. No attempt was made to maintain records on chlorination. Thus, it was impossible to obtain any accurate information about chlorine dosage, chlorine residuals, or chlorinator failures. This is extremely poor procedure which not only results in a lack of reliable information but also encourages careless operation.

3. Haphazard "booster" chlorination was practiced at the 1,200-cubic meter reservoir, with no chlorination accomplished on Sundays and holidays, and no records of any kind kept. When a chlorination station is operated, it should be operated in such a manner that records are maintained as to the amount of chlorine fed, the amount of water treated, and when treatment is carried out, including comments on any unusual occurrences. Without these data the chlorination is done haphazardly and gives a false sense of security.

4. As set forth in pertinent regulations, appropriate military personnel were responsible for making daily determinations of chlorine residuals at points of usage and for making at least weekly checks of chlorine dosage at all chlorination points. However, no chlorine residual checks were made on Sundays

or holidays and no checks were made on chlorine dosages. The lack of Sunday and holiday checks left a gap which was especially significant on April 22, one of the critical days of the outbreak. Had weekly dosage checks been made and had proper liaison been established with municipal personnel, the cause of this outbreak might have been detected sooner and the outbreak possibly averted.

5. Many troop units at Panzer Kaserne had on hand inadequate and/or obsolete supplies for use in water treatment. Personnel also displayed a lack of knowledge as to the proper use of the appropriate items. Therefore, the institution of water discipline was initially hampered. Since that time, Quartermaster sections have called in all supplies of obsolete items and have replaced them with the correct items.

CONCLUSIONS

This outbreak was caused by sewage-laden water entering the final inspection shaft at the Lower Murkenbach (E-Works) system. In all probability, either the quantity of contamination was so great as to utilize completely the chlorine being fed at the E-Works, or there was a chlorination failure at the E-Works at the time in question. Approximately a week later the first-mentioned situation did exist and in all probability existed at the time of the outbreak. The second situation is only presented as a possibility in view of the fact that no records were available to show otherwise. If the booster chlorinators at the 1,200-cubic meter reservoir had been functioning, there is a possibility that the outbreak could have been averted. The event is proof that such outbreaks do occur despite the often repeated phrase, "We have been operating for years and have never had any trouble."

Water-borne outbreaks of this type are relatively rare today, and because of this fact, many personnel in and out of the water works and public health field have acquired a complacent attitude concerning the precautions which must be taken if such outbreaks are to be prevented. This epidemic could have been much more serious than it was, for example, had the causative agents of typhoid fever or infectious hepatitis been present. It is hoped that the report of this outbreak will serve to identify a number of physical deficiencies in water works practice which should be avoided, that it will act as a warning to eliminate complacency, and that it will alert personnel to their responsibilities.

ACKNOWLEDGMENT: The authors wish to express appreciation for the advice and guidance furnished by Colonel Adam J. Rapalski, MC, USA, and Lt. Colonel Robert McCall, MSC, USA, Medical Division, Headquarters, U. S. Army, Europe, in the investigation of this outbreak.

UNILATERAL TOTAL LUNG CAPACITIES IN THE LATERAL DECUBITUS POSITIONS

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ARTHUR A. SIEBENS, *M. D.*

TURNING a patient onto his side alters the contributions of the two lungs to respiration. This observation is virtually as old as bronchospirometry itself and has been repeatedly confirmed.[1-6] The dependent lung shows a relative increase in oxygen uptake, greater "efficiency" of respiration as judged by a fall in the ventilatory equivalent, and changes in the subdivisions of the vital capacity.

Roentgenograms of the chest taken with the patient in decubitus positions suggest that the end expiratory volumes or functional residual capacities of the two lungs also must undergo extensive changes. Measuring the magnitude of these is the primary objective of the present study.

METHODS

Four patients were selected on the basis of the following: 1. Vital capacity and maximum breathing capacity were more than 90 per cent of the predicted value. 2. The distribution of the vital capacity when the patient lay in the supine position was normal (right lung, 50-60 per cent of total). 3. Fluoroscopy indicated unimpaired motion of the diaphragm. 4. There was no extensive pleural disease. 5. The measurement of functional residual capacity when the patient was in the decubitus position was acceptable. As criterion of this latter qualification, the sum of the functional residual capacities of the two lungs in the decubitus position was required to check within 12 per cent of the standard bilateral measurement made with the patient in the supine position. These patients, therefore, had unrestricted diaphragms and chest walls and probably had reasonable values for the functional residual capacity of each lung.

Bronchospirometry was performed under topical anesthesia with a Carlen's tube (a flexible, double-lumen catheter) placed

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This project was aided by a contract between the Office of Naval Research, Department of the Navy, and the State University of New York.

fluoroscopically. The patient was turned to either right or left lateral comfortable decubitus position, and given time to restore a stable respiratory pattern. Units for measuring the unilateral functional residual capacity by nitrogen washout were then attached to each lumen of the catheter and the patient allowed to breathe into these for nine minutes. At the end of this time, samples of alveolar gas were collected from each lung, the catheter was coupled to spirometers, and standard bronchospirometric measurements were made with the patient in the decubitus and supine positions. The entire bronchospirometric routine took about 20 minutes to complete. The method of measuring the functional residual capacity of each lung is described in greater detail elsewhere.[7]

With the patient in the sitting position, maximum breathing capacities were performed by having him breathe through a low-resistance valve into a Douglas bag. The bilateral vital capacity and its subdivisions were measured in the supine position. The open-circuit technic of Darling, Cournand, and Richards[8] was used in measuring the conventional functional residual capacity; the values tabulated are the mean of two measurements which checked within 10 per cent. All lung volumes were expressed at BTPS.

RESULTS

The functional residual capacity of the lung on the side on which the patient lay was always reduced and of the opposite lung was always increased. The redistribution of this volume was such that the left lung contained as little as 36 per cent of the volume of the right lung, or 26 per cent of the total functional residual capacity, when the patient lay on his left side; and the right lung contained 62 per cent of the volume in the left lung, or 38 per cent of the total, when the patient lay on his right side. The basis of these figures is tabulated in tables 1 and 2 and is shown in figure 1.

For purposes of summarizing the effects of position on volumetric compartments, the proportionate distributions (table 2) of the various compartments in the decubitus and supine positions were compared. It was assumed that supine residual volume and functional residual capacity were distributed as was supine vital capacity, the basis of this assumption being measurements of unilateral total lung capacities in persons with minimal pulmonary lesions. The figures which follow apply to the inferior lung, identical figures of opposite sign applying to the contralateral or superior lung.

The proportion of the *functional residual capacity* decreased in each instance, the range being 6 per cent to 20 per cent and the mean 13.8 per cent. The proportion of the *residual volume* was virtually unchanged in two patients (−5 per cent and +4 per cent) and fell 20 per cent and 26 per cent in the other two. The

TABLE 1. *Clinical data and unilateral functional residual capacities of four patients lying on their side*

Case	Diagnosis	Lateral decubitus	Functional residual capacity						Mixing index		
			Right		Left		Total	Bilateral			
			ml	Per cent	ml	Per cent	ml	ml	Right	Left	Bilateral
1	Tuberculosis, moderately advanced	Right	680	38	1120	62	1800	1786	1.273	3.109	0.849
2	Tuberculosis, minimal	Left	1615	65	868	35	2483	2712	2.883	2.145	0.878
3	Coin lesion	Left	1836	74	658	26	2494	2145	1.462	1.010	0.987
4	Bronchiectasis	Left	1332	70	564	30	1896	2118	1.060	5.902	1.334

TABLE 2. *Percentage distribution of volumetric compartments between both lungs of patients in supine & lateral decubitus positions*

Case	Vital capacity				Residual volume				Total lung capacity				Functional residual capacity				Inspiratory capacity				Expiratory reserve capacity			
	Supine		Decub.		Supine		Decub.		Supine		Decub.		Supine		Decub.		Supine		Decub.		Supine		Decub.	
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
	Right lateral decubitus																							
1	54	46	37	63	54	46	49	51	54	46	41	59	54	46	38	62	54	46	44	56	55	45	23	77
	Left lateral decubitus																							
2	59	41	63	37	59	41	55	45	59	41	60	40	59	41	65	35	57	43	54	56	62	38	77	23
3	54	46	48	52	54	46	74	26	54	46	57	43	54	46	74	26	53	47	45	55	64	36	71	29
4	57	43	57	43	57	43	68	32	57	43	58	42	57	43	70	30	55	45	50	50	63	37	72	28

proportion of the *vital capacity* changed 6 per cent or less in three patients and fell 17 per cent in one patient. Although the proportion of the *total lung capacity* fell in each instance, the magnitude of this fall was 3 per cent or less. The proportion of the *expiratory reserve* fell in each patient, the range being 7 per cent to 32 per cent and the mean 16.2 per cent. The *inspiratory capacity* increased from 5 per cent to 13 per cent in three patients and fell 10 per cent in one. Figure 2 illustrates the changes in the distribution of these volumetric compartments in one patient.

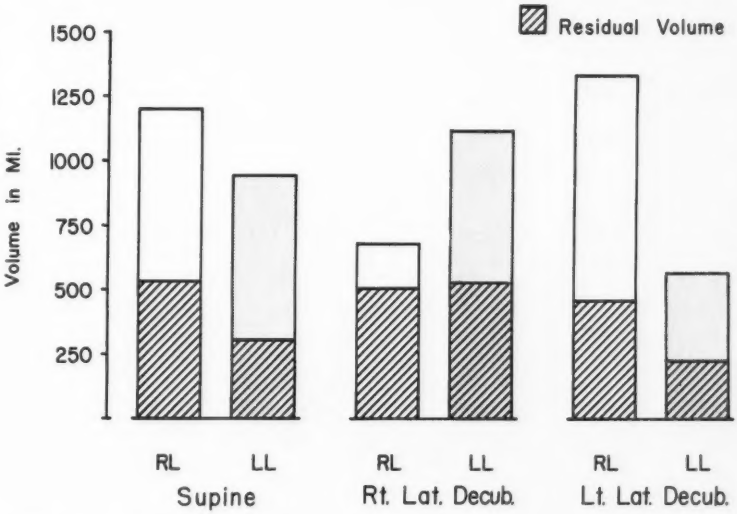

Figure 1. Unilateral functional residual capacities and residual volumes in three subjects lying in different positions. Supine volumes are those of patient No. 0523 in a previous publication.[7] Values for right and left lateral decubitus positions are those of patients 1 and 4 in the present report.

DISCUSSION

When a patient is turned onto his side, the end-expiratory volume of the ipsilateral lung is considerably reduced. Logic would lead one to anticipate such an effect, and roentgenography clearly indicates its basis: There is a cephalad displacement of the inferior diaphragm and a caudad displacement of the superior diaphragm. These changes affect not only the end-expiratory volumes of the two lungs (fig. 1) but their inspiratory and expiratory volumes as well (fig. 2). When the supine person is rotated along his longitudinal axis, therefore, gravity affects the subdivisions of the total capacity of each lung predictably. Rotation along a transverse axis also affects lung volumes by changing the position of the diaphragms;[9] these well known

effects being the basis of the rocking method for administering artificial respiration.

Roentgenograms published by Lowys, Marinet, and Marlin[10] show that the inferior hemithorax of the patient in the lateral decubitus is reduced in volume not only by elevation of the diaphragm but, in addition, by displacement of the mediastinum and collapse of the rib cage, particularly its upper portions.

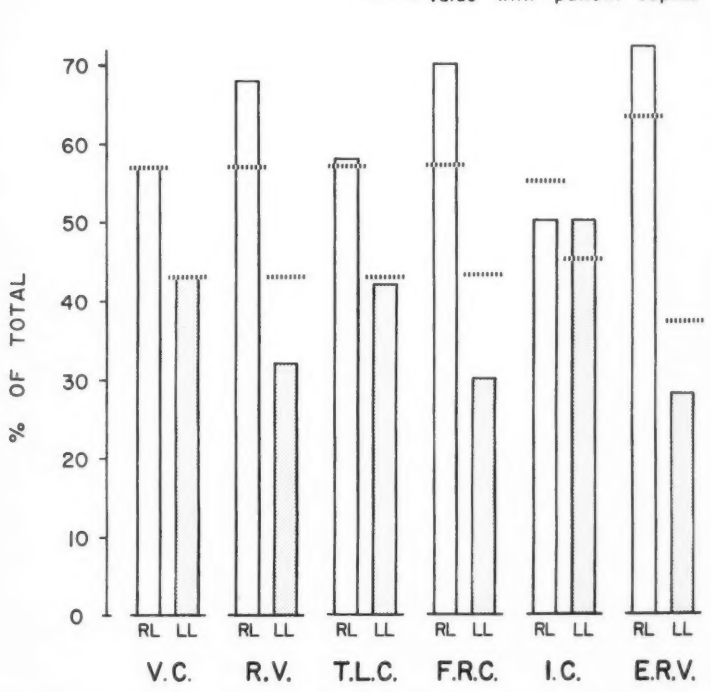

Figure 2. The distribution of volumetric compartments between the two lungs in patient 3 lying supine (horizontal broken lines) and on his left side (bars). The changes are representative of those which may occur when a patient is placed in the lateral decubitus.

These authors, publishing at a time when collapse was a principal form of therapy, used these effects of position therapeutically (*la cure latero-declive*). It should be observed that this practice would be at least as effective in reducing the functional residual capacity, that is, collapsing the lung, as phrenic crush alone or pneumoperitoneum alone. The former frequently has an equivocal effect on end-expiratory volume[11] and the latter rarely reduces this volume more than 30 per cent.[12,13] Among the present patients, this change exceeded 30 per cent in three instances

and was 22 per cent in the fourth. These percentages were calculated by dividing the supine functional residual capacity between the two lungs in proportion to the distribution of the vital capacity, subtracting the measured volume in the lateral position from the calculated supine volume for the corresponding lung, and dividing the difference by this calculated volume.

The force of gravity affects not only lung volumes and ventilation but, in addition, the distribution of blood flow throughout the lungs. A number of authors[1-6] have confirmed the fact that oxygen uptake is increased out of proportion to ventilation in parts of the lung below the level of the heart. This originally was found for the dependent lung when unilateral studies were first performed through the Jacobacus double bronchoscope[14] and has been demonstrated more recently for the right upper lobe of the erect and supine subject.[15,16]

Table 1 shows that when the patients were lying on their sides, the end-expiratory volume of the inferior lung was less than 900 ml. One wonders how low this figure falls at thoracotomy when the forces tending to keep mediastinum and superior diaphragm in position are disrupted and these structures fall in, as it were, on the inferior lung. The volume of this lung must be considerably less than in the closed chest and the cyclical variations in the composition of its contents correspondingly greater. It should be observed that all changes in lung volumes measured in the closed chest would be affected by increased rigidity of the diaphragms and other parietes. Our patients were selected specifically to ensure normal thoracic plasticity.

The primary objective of this study was to measure the effect of the decubitus position on the end-expiratory volume of each lung. One might inquire into the validity of the measurements, particularly since the unilateral mixing indexes (table 1) were uniformly higher than the bilateral figures. This difference is probably due to the fact that the ratio of apparatus dead space to unilateral tidal volume was higher for the bronchospirometric than for the conventional measurements of functional residual capacity. Although the customary time (seven minutes) allowed for nitrogen clearance was increased by two minutes for the unilateral procedure, this prolongation nevertheless did not completely offset the effect of the higher dead space ratio. In any case, errors possibly introduced by incomplete washout would be small, for functional residual capacity measured by nitrogen washout is relatively insensitive to terminal nitrogen concentration.

SUMMARY

The functional residual capacity of each lung was measured in four patients who were lying on their sides. Each patient had a normal distribution of the supine vital capacity. Thirty-eight per cent of the functional residual capacity was contained by

the right lung in one patient lying on his right side, and as little as 26 per cent of the total was contained by the left lung in patients lying on their left sides. The distribution of the other compartments of the total lung capacity is indicated.

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Clinicopathologic Conference

U. S. AIR FORCE HOSPITAL,
MAXWELL AIR FORCE BASE, ALABAMA

Summary of Clinical History. A 39-year-old navigator in the Air Force entered this hospital on 24 March 1958, complaining of tingling in his right side and confusion for two hours. The patient was in apparent good health until the day of admission, when he experienced a sudden onset of numbness and tingling in the right side of his body and head. He was confused and had to be escorted to the hospital. In the emergency room the patient was seen to have thrashing movements of the right side of his body, but he remained entirely conscious and continued talking during the episodes. A psychiatric illness was considered, but the patient was admitted to the neurologic service for further observation and treatment. There was no history of fever, chills, cough, previous headache, or epilepsy.

The patient had always enjoyed good health. He had otitis media and externa on the right in 1954 and 1957. Simple treatment was successful. In 1948 the patient had a mildly positive Wassermann reaction. A lumbar puncture at the time was negative. Recent annual physical examination findings had been within normal limits. No other significant information was gained from his past history. The family history was negative.

Physical Examination. The patient was well developed and well nourished. His blood pressure was 130/90 mm Hg; temperature, 98°F; pulse rate, 80 per minute; and respirations, 20. He appeared alert, although there was a question of minimal confusion

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From the neurological, neurosurgical, and pathology services, U. S. Air Force Hospital, Maxwell Air Force Base, Ala. Moderated and edited by Lieutenant Colonel James A. Jernigan, USAF (MC), chief of medical service. Colonel Julian A. Jarman, USAF (MC), is hospital commander.

when the patient was dealing with abstract concept. The general physical examination findings were within normal limits. There was no sign of otitis externa or media. The neurologic examination revealed equal and active reflexes in all extremities with no pathologic reflexes present. The patient was right handed. Coordination and general sensation were intact. There was a slight tendency for extinction of the right side on double simultaneous stimulation, especially when the right hand was stimulated along with the left cheek. The fundi, visual fields, and cranial nerves were normal.

Laboratory Studies. Admission laboratory studies revealed a white blood cell count of 9,100 per μl, with 70 per cent neutrophils, 26 per cent lymphocytes, and 4 per cent eosinophils. Hemoglobin was 15 grams per 100 ml. The hematocrit was 46 ml per 100 ml, and the sedimentation rate was 8 mm per hour. The urine was acid with a specific gravity of 1.013; albumin and sugar were negative. A spun sediment revealed occasional red and white blood cells. The blood serologic flocculation test was positive in 1:4 dilution. Roentgenograms of the chest and the skull were normal.

Course in the Hospital. The significant events during the patient's hospitalization are charted in figure 1. During the first day the patient complained of a headache. On the second day clonic movements were observed in his right foot and arm. This was followed by a bilateral synchronous grand mal seizure lasting two minutes. After that he displayed postictal confusion. An electroencephalogram showed symmetrical bifrontal slowing and some left temporal slowing. Within a few hours the patient recovered his state of alertness and was started on diphenylhydantoin sodium and phenobarbital.

On the third hospital day a repeat electroencephalogram showed a burst of high-voltage slow activity, most marked in the left parietal area. The focal activity was not as marked. Repeated neurologic examinations revealed no localizing signs.

On the fourth hospital day there was a definite change in the patient's condition. He had some difficulty using his right hand. When he walked, he had a tendency to fall to the right. A repeat neurologic examination revealed no astereognosis, ataxia, or manifest weakness of either hand. Sensorium was intact. The patient copied patterns very poorly. A lumbar puncture showed an opening pressure of 150 mm of water with clear fluid. The cell count was 2 red cells per μl. No unusual cells were seen. Protein was 44 mg per 100 ml. Cultures for bacteria showed no growth. The reaction to the Wassermann test was negative, but the reaction to the colloidal gold test was weakly positive in the first zone. On the evening of the fourth hospital day the patient began having right-sided focal seizures, starting in the trunk and spreading to the arm and leg but never involving the face. At first the patient was confused and showed some dys-

phasia, but in an hour he was rational and able to talk as the seizures continued. He received 500 mg of Sodium Amytal (brand of amobarbital sodium) intravenously, 600 mg of sodium phenobarbital intramuscularly, and 250 mg disphenylhydantoin sodium intramuscularly. Despite this therapy, the seizures continued for three hours. Finally the seizures stopped after he received 12 ml of paraldehyde intramuscularly. This was followed by a restless sleep during which he did not move his right side.

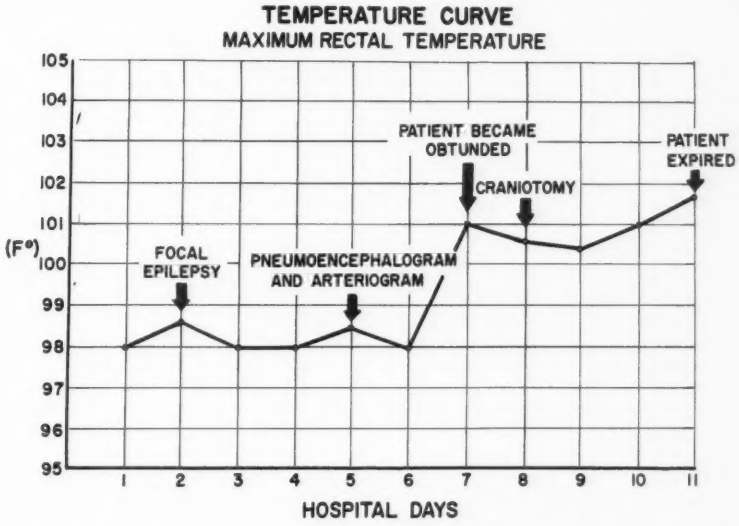

Figure 1. The significant events which occurred during the patient's hospitalization are noted on this temperature chart.

On the fifth hospital day a pneumoencephalogram and an arteriogram were made, but were not considered completely satisfactory. On the sixth hospital day the patient was more groggy but responsive. Reflexes were hypoactive but there still were no pathologic reflexes. Slight motion of the right leg was noticed but no motion was seen in the right arm. Fever of 101°F rectally appeared for the first time. The pulse ranged between 50 and 60. The right pupil seemed slightly larger than the left but both reacted to light. Funduscopy was negative. The neck was supple. The deep reflexes were equal but there was a Babinski response on the right. Laboratory studies showed a white blood cell count of 12,400 per μl, with a normal differential. Urinalysis, urine cultures, and blood cultures were negative.

On the eighth hospital day a craniotomy was performed through bilateral posterior parietal burr holes. The brain appeared to be under increased pressure, more on the left than on the right. The cortex was injected. A cannula was inserted on the left

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side and thick, purulent material escaped after penetration of about 2½ cm below the cortical surface. Fifteen milliliters of material were aspirated. The specimen was dark and had a fecal odor. Further aspiration resulted in soft, necrotic brain material being removed with some blood. There was no sensation of passing through a capsule. A cannula was placed in the right ventricle and clear fluid was obtained. Cannulas were left in place bilaterally. Intensive antibiotic therapy was instituted promptly after the surgical procedure, when the stained smear from the abscess showed streptococci. The patient was started on 30 million units of aqueous penicillin intravenously, 1 gram of streptomycin sulfate, and 1 gram of chloramphenicol intramuscularly every six hours. At this time the white blood cell count was 16,000 per μl, with 77 per cent neutrophils, 21 per cent lymphocytes, and 2 per cent eosinophils.

On the ninth hospital day the patient was completely comatose. A ventriculogram showed a shift of the ventricles from left to right. The neurosurgeon then performed a temporoparietal craniotomy. Aspiration through the dura in several directions revealed no pus. The patient was decompressed but the dura was not opened. Bacteriologic studies from the material obtained the day before revealed that the streptococci were anaerobic in character. Blood cultures again showed no growth. The antibiotics were continued as before.

On the tenth hospital day the patient stopped breathing and was put in a respirator. His pulse rate remained near 60. The maximum temperature was 101.2°F rectally. Hypotension developed and a vasopressor was started intravenously. The patient remained totally unresponsive. The pupils were dilated and fixed, with the right being larger. Some blurring of the right disk margin was seen. Further bacteriologic studies revealed that the anaerobic streptococci were sensitive to erythromycin, penicillin, and chloramphenicol, in that order. Two grams of erythromycin intravenously every six hours was added to the other antibiotic therapy. On the eleventh hospital day the patient's blood pressure became unobtainable and he died quietly.

DISCUSSION

Doctor Jernigan: At this time I should like to ask Dr. Pollard to comment generally on this case, to tell us what we did that was wrong in handling the patient, and to speculate on what Dr. Blanchard will reveal from the autopsy.

Doctor Pollard:* This patient, up until the moment before pus was found, probably had been suspected of having a brain tumor. The onset of convulsions at age 39 would make him a brain tumor suspect. His headache, sensory phenomena, and motor phenomena, including fits, all contain clues that would be helpful in the clinical evaluation of

*Capt. Lawrence W. Pollard, USAF (MC), chief, internal medicine.

a patient with a similar problem. This condition could have been a cerebrovascular accident. Its suddenness of onset would rather favor hemorrhage over thrombosis. This could have been a subdural hematoma, lead poisoning with encephalitis, tuberculoma, or a gumma. There was a past history of positive serologic tests, but if this had been a gumma one would have expected the spinal fluid to be positive for syphilis. There is no need to discuss these possibilities any further.

It is interesting that a patient with such an extensive lesion of the parietal lobe would have had sensory findings elicited only on the double simultaneous stimulation examination. Of course, this was noted soon after admission when there may have been a small focus of infection. As far as I have been able to learn, the technic of double simultaneous stimulation was first described by Bender[1] in 1945. The technic is one of stroking or touching the blindfolded patient with unaided fingers on widely separated areas simultaneously in a quiet room. In a later series, Bender, Shapiro, and Schappell[2] found that 44 out of 50 hemiplegic patients had partial or complete extinction of sensation on the injured side. Interestingly enough, only 29 of these had sensory deficits when tested by the routine single stimulus technic. In a later study of 400 people with cerebral difficulty, Bender, Fink, and Green[3] found reproducible differences between stimulation of a cheek and stimulation of the dorsum of the contralateral hand. They found that in normal people from age 7 to 60 years, 85 to 90 per cent correctly identify both stimuli on the first trial. A smaller percentage of older and younger people have the ability to perceive the simultaneous stimuli.

Discomfort on the right side of the head was a prominent complaint this patient had following admission. Wolff[4] found that only two groups of intracranial structures were pain-sensitive. First, there are the great vessels, including the connecting branches, the veins, and major venous sinuses. The second group includes the cranial nerves 5, 9, and 10, and the upper three cervical nerves. In a group of 72 patients with localized solitary expanding intracranial lesions, Wolff found that the site of the headache was a reliable indicator to the location of the tumor or expanding lesion in only one third of the series. In a select group, however, it was more accurate. This was a group with supratentorial headache and no papilledema. Though this patient did meet these criteria, his symptoms were on the right, and the pathologic lesion was noted on the left. The patient's motor phenomena, including his recurring grand mal seizures with Jacksonian type progression starting in the right arm and leg on his initial hospital day, were a dramatic and important part of his clinical picture. Thus, the seizures pointed to the left cerebral hemisphere, where a brain abscess was found.

Now let us speculate on the cause of this brain abscess. Information in the protocol does not suggest where the infection originated. The primary foci for brain abscesses are conveniently divided into five groups. The immediate areas around the brain most frequently serve as the primary focus. About 50 per cent come from infections in the

ear and 10 per cent come from the nose and nasal sinuses. Twenty per cent come from localized infection elsewhere, particularly the lungs and heart. Trauma with direct brain injury inoculation account for another 5 per cent. Miscellaneous infections and unknown sites make up the remaining 15 per cent.

Ascending and descending in aircraft, as this man did in flying, is often effective in bringing latent infections in the ears and sinuses to clinical attention. For this reason, plus the negative physical examination, I am bypassing these as possible sources of infection. Special roentgenograms of the teeth and sinuses may have pointed to a site, but we do not have this information. Thus, I do not know how the brain abscess originated.

The question of what to do was posed by finding anaerobic streptococci in the brain abscess. Anaerobic streptococci are often present in the mouth, nasopharynx, and sinuses of healthy people. It is a common inhabitant of the vagina. Ordinarily they become vicious criminals only under anaerobic conditions. These conditions are met in the post-partum uterus, in the lungs following pulmonary infarction, in the paranasal sinuses, in the brain, and after human bites. Many strains are penicillin resistant, but this is not an absolute resistance. The method of treatment is generally with intensive doses of penicillin. This was done, as the patient received almost 100 million units daily, in addition to the other antibiotics. This patient certainly had a resistant strain.

It is expected that the infection would have a spreading tendency. One of the characteristics which made the streptococci so clinically important are the enzymes and substances that the living streptococci produce, particularly spreading factors such as hyaluronidase. It would not be surprising then that this abscess was not well encapsulated.

In conclusion, I believe that the patient expired from the progressive abscess extension through the brain substance. Rupture into the ventricles or into the cerebrospinal spaces with meningitis and a focus for metastatic infection may be found. Dr. Blanchard may show a focus in the heart or lungs which was not discovered clinically. A more likely primary source of infection, in my opinion, however, would be an asymptomatic apical abscess of a tooth. Bacteremia may have occurred during chewing. The tooth could move up and down in the tooth pulp like a piston, each time forcing another little fragment of this apical abscess material into the blood stream. The brain abscess could follow. Now let me hear what really happened.

Doctor Jernigan: Dr. Pollard, first let me ask you a few questions. The antibiotics did not seem to help. What else might have been done that would have changed the outcome of this case? And what do you think about the absence of fever for at least six days during the development of the abscess?

Doctor Pollard: The patient apparently did not have a local instillation of antibiotics. Early and thorough drainage of brain abscesses,

combined with appropriate antibiotic and supportive care, may be effective treatment. I refer you to the British literature for some excellent work in this area.[5] Even so, all patients cannot be saved. It is still a very serious disease. After the infection is controlled, many patients have marked disability from residual brain damage.

Fever frequently is not present in patients with brain abscesses. This is an interesting clinical fact that may delay early therapy. At least one clinician[6] has emphasized the absence of fever, or even hypothermia, when associated with bradycardia as a sign suggesting brain abscess.

Doctor Jernigan: Dr. Blanchard, the primary question now is, where did this brain abscess originate? We would like to hear your autopsy report.

PATHOLOGIC FINDINGS

Doctor Blanchard:* The autopsy was performed approximately 14 hours following death. The body was that of a well-developed, well-nourished white man who appeared the stated age of 39 years. He measured 180.5 cm in length and was estimated to weigh 180 pounds.

Upon removal of a surgical dressing from the scalp, an 11-cm surgical incision was noted just anterior to the left ear and 3-cm surgical incisions were noted bilaterally over the posterior parietal regions of the skull. Cannulas were protruding from the posterior incisions. The scalp was markedly edematous, measuring 15 to 20 mm in thickness.

The brain weighed 1,600 grams and was soft in consistency. The veins over the left cerebral hemisphere were dilated. There was an area of localized meningitis over the parietal lobe of the left cerebral hemisphere. The meninges otherwise were not remarkable. The gyri were broadened. Multiple sections through the brain revealed an area of suppuration in the left parietal lobe that extended from the insula to the thalamus (fig. 2). The cavity was superior and lateral to the ventricle, which was displaced medially and inferiorly. The abscess contained a small amount of purulent material and the lining was irregular and brownish red in color. Culture of the material grew anaerobic streptococci. The ventricular system was not involved. Sections through the pons and medulla showed focal areas of necrosis.

The venous sinuses were not thrombosed. Upon removal of the petrous portion of the temporal bone, the middle ears and mastoid air cells appeared normal.

The pericardial sac contained about 100 ml of purulent, foul-smelling, reddish-brown fluid. Culture of this fluid also grew anaerobic streptococci. There were numerous petechial hemorrhages over the pericardium. The microscopic evidence of pericarditis and myocarditis is seen figures 3 and 4. The heart weighed 350 grams. All valves were

*Capt. Richard J. Blanchard, USAF (MC), pathology service.

normal. There was no involvement of the aortic valve or aorta to suggest syphilis.

The lungs were similar in appearance. The right weighed 800 grams and the left 1,100 grams. The dependent portions were blue gray in color and lacked crepitation. On cut section a moderate amount of frothy fluid could be expressed. The tracheobronchial tree was almost completely filled by a thick mucoid secretion.

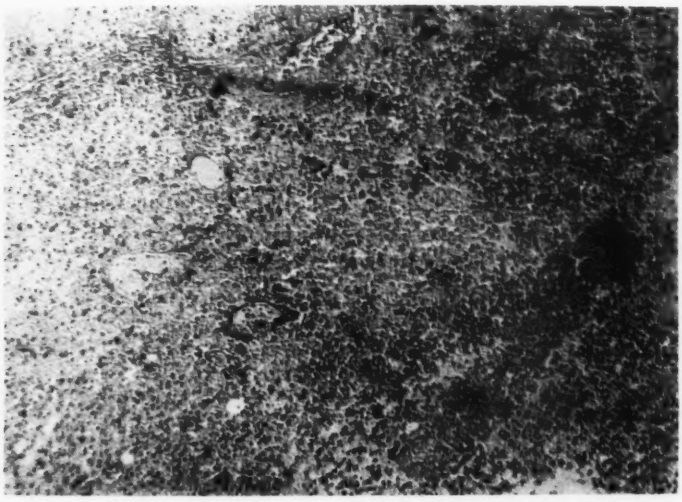

Figure 2. This section from the margin of the abscess in the left parietal lobe shows that the infection is acute. On the right side of this specimen is a mass of necrotic brain substance and neutrophils which contains bacterial colonies. In the midportion there is a beginning attempt at localization, supported by inflamed vascular brain tissue on the left side of the photomicrograph. (× 105)

The remainder of the organs were not remarkable on gross or microscopic sections.

In conclusion, the autopsy revealed pericarditis that was not detected clinically. In addition, there is evidence to suggest that the immediate cause of death was necrosis of vital centers in the pons and medulla. The autopsy did not include an examination of the teeth. Thus, I cannot exclude the possibility of an apical abscess as the primary focus, as Dr. Pollard suggested. I cannot say whether the brain abscess or the pericarditis came first.

Finally, it is clear that the anaerobic streptococcus was not appreciably affected by the massive antibiotic therapy the patient received.

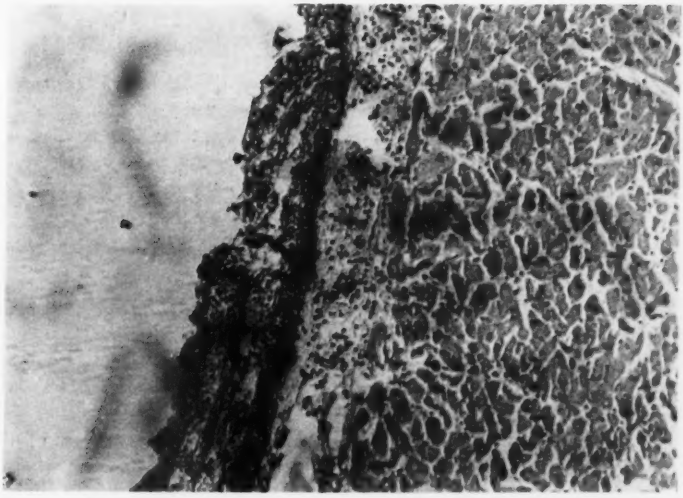

Figure 3. Section of the pericardium showing the inflammatory cells and fibrin deposited over the surface of the heart. (× 105)

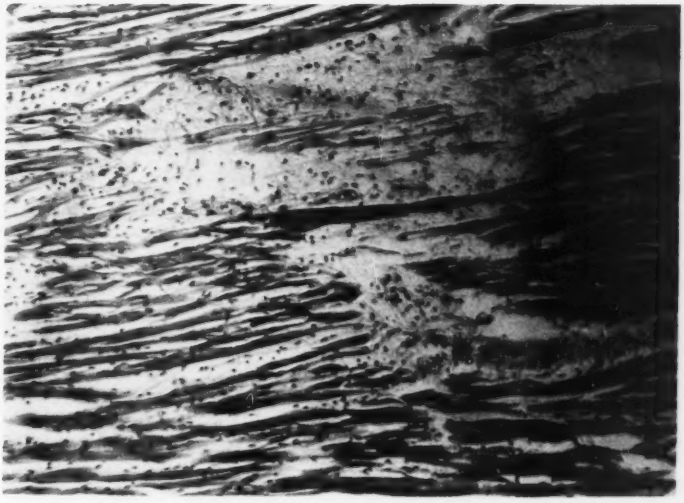

Figure 4. Section of the heart showing a myocarditis. The infiltrate is composed of plasma cells and lymphocytes and is chiefly just beneath the epicardium. The inflammatory reaction here is probably due to the inflammation of the pericardial sac. (× 105)

Final pathologic diagnoses:

1. Focal necrosis in the pons and medulla, due to cerebral edema and pressure.
2. Brain abscess, parietal lobe of the left cerebral hemisphere, due to anaerobic streptococcus.
3. Purulent pericarditis due to anaerobic streptococcus.

Doctor Jernigan: Thank you, Dr. Blanchard. We see once more that even the pathologist cannot answer all the questions.

Dr. Graham, the neurosurgeon who operated on the patient, could not be present today, but Dr. Silvernail, our other neurosurgeon, is here. Dr. Silvernail, do you have any comments on the surgical treatment of brain abscesses? When is the time to operate on this type of case? Has the antibiotic era changed your approach to the brain abscess?

Doctor Silvernail:* No, antibiotics have not changed the surgical approach. Brain abscesses manifest themselves in many ways. First, they are divided by their location into epidural, subdural, cortical, or intracerebral brain abscesses. They give signs and symptoms, as does any expanding lesion, by pressure and necrosis on nervous structures. One cannot make a diagnosis from the outside that it has encapsulated; one can suspect it has encapsulated if the spinal fluid is clear. If the abscess is localized and encapsulated, radical incision, drainage, and antibiotics will probably cure it.

If there is subcortical dissemination, similar to cellulitis, surgical drainage is going to be ineffective, antibiotics will not localize it, and the patient probably cannot be saved, even with the most radical procedure. Unfortunately, this patient had such an infection. The dissemination was too great. My guess would be that more radical surgery would not have saved him. Had he lived after more radical surgery, he probably would have been totally disabled. However, once the brain abscess is entered surgically, regardless of the amount of encapsulation, I would recommend the most radical removal possible with wide drainage. A drain the size of a rectal tube is needed so that this area can be drained and flushed out as extensively as possible. If it is metastatic in origin, there is a fair chance that there is more than one abscess, and a thorough search must be made.

Doctor Jernigan: Dr. Abrams, you suggested that we use the antibiotic ristocetin on this man. As you know, the patient expired before it could be given.

Doctor Abrams:** Ristocetin has been offered as a lifesaving antibiotic where others failed. It has given good results with gram-positive organisms that have been resistant to other antibiotics. I noticed

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**Maurice J. Abrams, M. D., civilian consultant in internal medicine.

recently, however a report of two cases of marked leukopenia following its use.[7] Both patients recovered after the drug was stopped.

I think that in any fulminating infection there are a number of pitfalls. One must realize always that organisms are often very prodigious and are very prolific. If the patient is not responding to one drug, you try another or several in combination. In the seriously ill patient with overwhelming infection, you do not give trial dosage of drugs. You apply massive dosage from the beginning.

There are just one or two things that I would like to add. As far as the bacteriology is concerned, the odor of the anaerobic streptococcus is so characteristic that it was initially called *Micrococcus fetidus.* It has been insufficiently investigated, so that it has not been put in any of the known groups, A through O. Too, there is some question about the enzymatic system of the anaerobic streptococcus because it is thought that it, with Group B, does not produce desoxyribonuclease. Apparently they all produce fibrinolysin and hyaluronidase.[8]

Doctor Jernigan: Mr. Johnson, as the bacteriologist on this case, do you have any additional information to offer about this deadly bacteria?

Mr. Johnson:* This bacteria produces no "C" reaction protein, and therefore cannot be classified serologically. I think we proved that the bacteria from the brain abscess and the pericardium were the same. Apparently they had not been affected by the antibiotics. Thus, the in vivo sensitivity did not compare with the in vitro sensitivities. This certainly is not a rare observation.

Doctor Jernigan: Dr. Cocks, do you have any comments to make?

Doctor Cocks:** One does not need to have increased cells and proteins in the cerebrospinal fluid and fever to suggest brain abscess. In some series this finding is often absent. Severe focal seizures and focal persistence such as this patient had the third or fourth hospital day are suggestive signs of brain abscess.

Doctor Jernigan: Dr. Morgan, you were the principal physician until the patient was transferred to the neurosurgical service. We should like to have your comments.

Doctor Morgan:*** I would like to comment on the quality of the headache. It was a sudden, sharp, painful, tingling numbness which actually may have represented either an aura of the seizure or an abnormal phenomenon itself. It was not similar to the usual headache that one sees in intracranial expanding lesions.

Doctor Jernigan: These comments from the clinicians and the pathologist speak for themselves. The site of origin for the anaerobic streptococcus which caused the brain abscess and pericarditis re-

*Cardis N. Johnson, bacteriologist.
**Lt. Col. George R. Cocks, USAF (MC), chief, neurology service.
***Capt. Peter P. Morgan, USAF (MC), neurology service

mains unknown. In general, we heard that earlier surgical attack and other antibiotics may have altered the course. However, most agree that our present means of therapy is frequently inadequate for this type of central nervous system infection.

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NOISE IN HOSPITALS

Noise is relatively disagreeable sound. A hi-fi set may soothe one, yet irk another. The arguments pro and con jazz are legion. However, there's very little disagreement concerning the noise making potential of a hospital. Man and machines compound an "impact of decibels," which unnoticeable to the healthy, can prove of considerable annoyance to the ill. Some sound may prove helpful in combatting the psychological hazards of sensory deprivation which many patients are subjected to in a hospital environment. Noise on the other hand, generated by many discordant sources, can be annoying and even relatively harmful. With an ear cocked for noise, we suddenly become painfully aware of the rumbling food cart, the squeaky bed, the hissing radiator, the slamming elevator door, the wooden heels of the corpsmen, the various repairmen involved in their clanging and banging, the jarringly loud telephones, the blasting paging systems (for long distance traffic it would appear), the patients' loud radios and a seemingly endless succession and superimposition of annoying noises. A noisy hospital loses its dignity. Let's reduce the decibels and make our hospitals quiet places for quiet speedy recovery.—Hospitals and Decibels. *USAFE Surgeon Comments,* February 1959.

WALTER REED ARMY MEDICAL CENTER, OPENED IN 1909, CELEBRATES FIFTIETH ANNIVERSARY

Walter Reed Army Medical Center, a renowned military treatment facility located in the District of Columbia six miles north of the Nation's Capitol, celebrated its 50th anniversary on 1 May. Dedicated in 1909 as Walter Reed General Hospital in honor of the "conqueror of yellow fever," its name was changed in 1923 to the Army Medical Center. On the centennial of the famous Army doctor, in 1951, the hospital was renamed Walter Reed Army Medical Center. A Class III installation, commanded by Major General Leonard D. Heaton, MC, USA, the center includes Walter Reed Army Hospital, Walter Reed Institute of Research, Central Dental Laboratory and the Army Prosthetics Research Laboratory. One of the largest and best equipped in the world, the hospital has cared for more than 405,000 patients since 1909. The original capacity of about 80 beds has been expanded to 1,250, but when the Korean fighting was at its height, as many as 2,300 patients were cared for at one time. The yearly bed patient average is about 16,000.

Walter Reed General Hospital in 1909.

Walter Reed Army Medical Center as it appears today.

ARMY, NAVY OFFICERS PRESENT PAPERS AT AMERICAN COLLEGE OF PHYSICIANS MEETING

Military medical officers presented several important clinical studies in the scientific program of the fortieth annual session of the American College of Physicians held in Chicago, 20-24 April. The speakers and titles of their papers included:

Congenital Anomalies of the Lung: Practical Aspects of Diagnosis and Treatment for the Internist—*Colonel James A. Wier, MC, USA,* Fitzsimons Army Hospital, Denver, Colo.

The Reliability of Tissue Diagnosis in Pleurisy: A Preliminary Report—*Major Joel H. Richert, Colonels James A. Wier* and *John M. Salyer,* and *Major James C. Beyer, MC, USA,* Fitzsimons Army Hospital, Denver, Colo.

Aseptic Meningitis: Including EEG Abnormalities—*Captain Robert B. Abington,* Tripler Army Hospital, T. H.; *Colonel Wilbur C. Berry,* Madigan Army Hospital, Tacoma, Wash.; and *Captain Frederick S. Armstrong, MC, USA,* Walter Reed Army Hospital, Washington, D. C.

Paradoxial Lengthening of Muscle Contraction in Hypothyroid Patients Given Small Doses of Liothyronine, Thyroxine, and Desiccated Thyroid— *Captain Arthur S. Weissbein,* and *Major John D. Lawson, MC, USA,* Brooke Army Hospital, San Antonio, Texas.

Ventricular Depolarization and the QRS Complex—*Captain Robert V. Erickson, MC, USA,* Army Medical Research Laboratory, Fort Knox, Ky.

Some Aspects of the Metabolism of Pentose Sugars in Man—*Lieutenant Colonel Irvin C. Plough, MC, USA,* and *Captains Edwin L. Bierman, MC, USA,* and *Eugene M. Baker, MSC, USA,* Fitzsimons Army Hospital, Denver, Colo.

Problems Common to Ships of Outer and Inner Space—*Captain Harry J. Alvis, MC, USN,* Bureau of Medicine and Surgery, Washington, D. C.

Physiological Stresses Engendered by Acceleration—*Captain Charles F. Gell, MC, USN,* Office of Naval Research, Washington, D. C.

Surveillance of the Measurement of the Physiological Response to Space Flight—*Captain Norman L. Barr, MC, USN,* Bureau of Medicine and Surgery, Washington, D. C.

A scientific exhibit on the Intestinal Biopsy Capsule from the Armed Forces Institute of Pathology was presented by Lieutenant Colonel William H. Crosby, Jr., and Majors C. E. Butterworth, Jr., and Robert W. Smith, MC, USA, Walter Reed Army Institute of Research, and Colonel Benjamin H. Sullivan, Jr., MC, USA, Walter Reed Army Hospital, Washington, D. C.

ALASKA VISITOR. Dr. Edward H. Cushing, Deputy Assistant Secretary of Defense (Health and Medical), left, is shown with Lt. General Frank A. Armstrong, Jr., USAF, commander in chief, Alaskan Command, and Brig. General John R. Copenhaver, USAF (MC), command surgeon, during a recent inspection of Department of Defense medical facilities in the new state. General Copenhaver, upon completion of his Alaskan tour of duty in June, will become surgeon of the Tactical Air Command, Langley Air Force Base, Va.

NAVY OFFICERS PARTICIPATE IN DENTAL MEETINGS

Captain Charles T. Pridgeon, and Lieutenant Commander Charles S. Scruggs, DC, USN, will present papers at the 79th annual conference of the British Dental Association, at Torquay, England, 25-29 May 1959, on "The Clinical Use of Anorganic Bone in Selected Infra-Bony Peridontal Pockets," and "Indications for Endodontics," respectively. They also spoke at the annual clinical meeting of the American Dental Society of London, 19 March 1959. The two officers are on duty with the U. S. Naval Support Activity, London.

Lieutenant Ralph P. Huestis, DC, USN, U. S. Naval Air Station, Whidbey Island, Washington, presented a table clinic on "Vibration Technic for Amalgam Restoration" at the annual meeting of the Washington State Dental Association in Seattle, 6-8 April.

ARMY DENTAL CHIEF IN JAPAN. Major General James M. Epperly, Chief of the Dental Division, Office of the Army Surgeon General, salutes the colors at an honor guard ceremony held in his honor at Camp Zama, Japan, during a visit in March. With General Epperly are Captain Walworth F. Williams, honor guard commander, left, and Major General David H. Tulley, USA, rear, commanding general, U. S. Army, Japan.

FLICKINGER AND BARR ON AGARD PROGRAM IN ATHENS

The joint meeting of the Flight Test and Instrumentation, and Aeromedical Panels of the Advisory Group for Aeronautical Research and Development, (AGARD), in Athens, Greece, 11-15 May, will include the presentation of papers by Brigadier General Donald D. Flickinger, USAF (MC), on "Psychological Stress Problems in Flying Personnel," and Captain Norman L. Barr, MC, USN, on "Technics of Transmitting Physiological Data from North America to Athens from Patients."

United States members of the Aeromedical Panel of AGARD are: Lieutenant Colonel R. B. Austin, III, MC, USA, chief of the aviation branch, Medical Plans and Operations Division, Office of the Army Surgeon General; Colonel Paul A. Campbell, USAF (MC), chief, Space Medicine Division, Air Force School of Aviation Medicine; and Captain Charles F. Gell, MC, USN, special assistant for medical and allied sciences, Office of Naval Research.

CAPTAIN HOLLER RECEIVES COMMENDATION

Captain Moffitt K. Holler, MC, USN, right, received a commendation from Rear Admiral E. W. Grenfell, Commander Submarine Force, U. S. Pacific Fleet, in a ceremony aboard the U. S. S. *Gudgeon*, 10 January 1959. The commendation, for outstanding service from June 1956 to January 1959, makes special mention of Dr. Holler's supervision over twenty cases of decompression sickness, which were "successfully treated, averting serious physical disability and, in several instances, death."

AIR FORCE COLONELS DECORATED. Major General Oliver K. Niess, Air Force Surgeon General, congratulates three award winners following presentation of awards in a ceremony on 13 March 1959. Left to right; Colonel Jack C. Carmichael, USAF (MSC), who received the Legion of Merit; Colonel Herbert W. Coone, USAF (MC), the Air Force Commendation Medal; and Colonel Ralph M. Lechausse, USAF (MC), the Legion of Merit. All are assigned to duty in Washington.

A Message From the A. M. A

Megaton nuclear devices and missiles delivery weapon systems have radically changed concepts of warfare. The inevitable concomitant is radically changed concepts of emergency medical treatment. The increase in the destructive power of weapons means a correspondingly larger involvement of civilian populations in warfare. This larger involvement of civilian populations in any future war, which may unleash its massive destructive fury with warning time counted in but minutes, requires prior, cool, judicious planning and organization to minimize the effects of modern weapons. In these days of warlike coexistence for peace, there is urgent need for a suitable national plan that will offer the nation's people the best feasible protection against nuclear weapons and the best possible disaster medical care.

Civil defense has been a concern of government since before World War II. In the Federal government, the responsibility, in varying degree, for civil defense over the years has reposed in many different agencies. Since 1950 with the creation of the Federal Civil Defense Administration, the first independent agency wholly concerned with civil defense, there have been plans for the medical care of stricken populations after enemy attack. Original plans were based on an A-bomb attack, (nominal or 20,000 ton TNT equivalent) and envisioned three echelons of service: (1) self-help, family-help, neighbor-help and community-help; (2) mutual assistance, or the support and aid that would come from the surrounding populace, for example, suburbs in the case of large cities; and (3) mobile reserve, or those units that would come a distance to give aid and succor to a strickened community. Medical care would follow three steps: (1) first aid, given either in the rubble, at collecting points in the field by field first-aid teams, or at the first-aid station; (2) emergency surgery at the 200-bed Civil Defense Emergency Hospital; and (3) definitive care at existing hospital and medical facilities.

As bombs became larger and weapon delivery systems speedier it was necessary to revise these plans considerably. Limitations of staff, inadequate facilities for securing vital data, urgency of daily operation, administrative problems and a variety of other causes did not permit the staff of the then Federal Civil Defense Administration Health Office to engage in this type of necessary planning. As a consequence, on 10 December 1956, the Federal Civil Defense Administration requested the American Medical Association, through its Council on National Defense, to undertake a study to establish criteria for the provision of medical

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From the Council on National Defense of the American Medical Association. The views and opinions expressed are not necessarily those of the Department of Defense. —*Editor*

care of the surviving population, casualty and noncasualty, in the event of an enemy attack on this nation. The proposal was presented to the Board of Trustees of the Association on 9 February 1957. The Board authorized the Council on National Defense to explore this proposal in detail. A formal contract between the United States Government, acting through the Federal Civil Defense Administration, and the American Medical Association was signed on 26 July 1957. In broad terms the contract specified that the Association should "study, develop and recommend the planning, training and operational organization needed as a basis for a National Emergency Medical Care Plan for the treatment and care of casualties and noncasualties prior to, during and after a hypothetical 20 megaton ground burst thermonuclear attack upon a selected geographical area or areas of the United States."

To facilitate work on this project, the Association created the Commission on National Emergency Medical Care. The six members designated to serve on the Commission were Brigadier General Harold C. Lueth, MC, USAR, Chairman, Captain Carroll P. Hungate, MC, USNR, John F. Burton, M. D., Robert L. Novy, M. D., Colonel Karl R. Lundeberg, MC, USA, (Ret.) and Colonel Hanns C. Schwyzer, MC, USAR. Major General Earle Standlee, MC, USA, (Ret.) was named staff director. Three task forces on organization, emergency medical care, and personnel training and utilization, were created. Serving on these task forces were qualified and dedicated personnel from the health professions. Throughout the study, opinions were obtained from many of the national health agencies, the voluntary health associations, personnel in various branches of the government, from individuals and from prior reports, studies, plans and recommendations of many organizations, both governmental and nongovernmental. From all these sources the Commission developed recommendations that can be used as a basis for a national emergency medical care plan.

During the period of the study there were significant accomplished changes in the government agencies concerned with civil defense affairs. Other changes have been proposed and are under study. On 1 July 1958 under the President's Reorganization Plan No. 1 of 1958, the Federal Civil Defense Administration and the Office of Defense Mobilization were consolidated to form the Office of Civil and Defense Mobilization in the Executive Office of the President. Former Governor of Iowa Leo A. Hoegh, who had been Administrator of the Federal Civil Defense Administration, was appointed Director of the new agency by the President. Another significant development was the proposed delegation by the President of certain responsibilities for civil defense health services to the Secretary of Health, Education and Welfare for discharge by the United States Public Health Service under the policy guidance and direction of the Office of Civil and Defense Mobilization. Principally, this proposal concerns the re-

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sponsibility for planning a nationwide health and medical care program dealing with the care of the civilian population in the event of an enemy attack. The American Medical Association favored these developments and was of the opinion that much ambiguity, uncertainty and confusion of past organizational structure would be obviated.

Yet another important development was the promulgation by President Eisenhower in October 1958 of the National Plan for Civil Defense and Defense Mobilization. When completed by the addition of 40 operational annexes, all phases of civil defense operations will be covered. Annex No. 7, "Role of the Military," which is now ready for promulgation, will be of particular interest to military personnel. It sets forth the responsibilities of the Armed Forces of the United States in assisting civil authority in time of national emergency or other disaster.

The Association's Commission on National Emergency Medical Care completed its study in November 1958. After careful review by the Council on National Defense and other departments of the Association, the final report of the Commission was adopted by the Board of Trustees on February 24, 1959. The report was submitted to the Office of Civil and Defense Mobilization last month.

Developing criteria for planning, training and operating a medical service that will give the greatest good to the largest number of people under the catastrophic conditions resulting from a thermonuclear burst of 20 megatons required bold thinking, resourceful planning and radical departures from accepted patterns of scientific medical care. All individuals and organizations that were requested to assist the Association in this unique and challenging task, did so with zeal and devotion. Their dedication is worthy of the highest praise.

The implications of nuclear attacks are so great that each physician, dentist, veterinarian, nurse and health worker must prepare to give medical service of a type and scope that has never been done before. It would be well for all health workers, military and civilian, to give this matter their most serious consideration.

NAVY COLOR VISION FILM WINS AWARD

"Color Vision Deficiencies," a 20-minute motion picture film produced in color by the Navy's Bureau of Medicine and Surgery has received an Edinburgh International Film Festival certificate. The certificate was presented by British Ambassador Sir Harold Caccia to Rear Admiral Wellington T. Hines, USN, Deputy and Assistant Chief of the Bureau of Aeronautics, during ceremonies in Washington on 9 March. During the past fifteen years the Navy has received more than 30 national and international prizes for its motion pictures.

Officers Certified by Specialty Boards

The Surgeons General of the military medical services have announced that the following regular Medical and Dental Corps officers have been certified by the boards indicated.

American Board of Dermatology

Flanagan, Brian P., Maj., USAF

Jacobs, Paul H., Capt., USAF

American Board of Internal Medicine

Gerard, Earl S., Capt., USA

Cardiovascular Disease

Parmley, Loren F., Jr., Lt. Col., USA

Pulmonary Diseases

Dunnington, William G., Col., USA

Richert, Joel H., Maj., USA

American Board of Ophthalmology

Jones, Carlton E., Capt., USAF

American Board of Oral Pathology

Hansen, Louis S., Capt., USN

American Board of Pathology

Clinical Pathology

Ray, John P., Jr., Capt., USA

American Board of Pediatrics

Smith, Robert E., Capt., USAF

American Board of Psychiatry and Neurology

Psychiatry

Billet, Sanford L., Capt., USAF

American Board of Radiology

Medical Nuclear Physics

Griffin, Martin E., Jr., Capt., USA

Maier, John G., Capt., USA

Langdon, Edward A., Lt. Col., USA

American Board of Surgery

Bentivegna, Saverio S., Capt., USA

Henderson, Harry M., Jr., Lt. Col., USA

American Board of Urology

Johnston, Robert E., Lt. Col., USA

PROTEIN FOUNDATION REPORTS PROGRESS IN BLOOD STUDIES AT CHELSEA NAVAL HOSPITAL

Significant progress in studies at the U. S. Naval Hospital, Chelsea, Mass., on red blood cell preservation by freezing are revealed in the fourth annual report of the Protein Foundation and the Commission on Plasma Refractionation and Related Processes which was recently published. Charles A. Janeway, M. D., professor of pediatrics at Harvard Medical School, is president of the foundation which is cooperating with the Navy in the work now in progress at the Blood Research Laboratory in Chelsea. The report, in part, states:

Approximately seventeen years have elapsed since the intense program of plasma fractionation was begun under the impetus of the wartime need for a safe and effective plasma expander. Normal human serum albumin, used in limited quantities at Pearl Harbor, was the first human plasma derivative to emerge from that program. Since then, the blood has proved a wellspring to knowledge of bodily functions; and on the practical side of the ledger, several beneficial, indeed lifesaving, properties of the blood can now be made use of by the physician for the alleviation of suffering. Some of today's investigations concern the same phenomena which occupied the attention at the beginning of the program. Other investigations are quite new, often made possible by the advent of new techniques that permit hitherto impossible experimental access to new problems.

As in the past, an active group of investigations is being pursued on the blood cells. One of these is devoted to the long-term preservation of red cells, a project which carries important implications for the public health and the national defense. This work has been under the direction of Dr. [James L.] Tullis; it continues in two phases. The first, a fundamental study, has been in progress for some years in the Blood Characterization and Preservation Laboratory, and led to the establishment of practical procedures for introducing glycerol into red cells prior to freezing and also to methods for ultimate removal of the glycerol and return of the cells to an environment satisfactory for intravenous use. During the past year, the study has been concerned with the kinetic aspects of the passage of the glycerol in and out of the cell—important both for the light such information can shed on the nature of the cell membrane as well as on the practical problem of the maximum rate at which the routine processing of cells can be carried out. It has been found that divalent cations in the medium, particularly magnesium, can have a strong influence on the rate at which glycerol comes out of the thawed cells. In addition, careful studies have been made on the effect of the biochemical environment on the over-all survival of cells following freezing; this included the effect of added glucose and high-energy phosphate compounds, important to the metabolic activity of the cell.

Left to right: Dr. W. K. Jordan, vice-president, Protein Foundation; Rear Admiral Carl F. Espe, USN, commandant, First Naval District; Dr. Frank B. Berry, Assistant Secretary of Defense (Health and Medical); and Captain Cecil D. Riggs, MC, USN, commanding officer, U. S. Naval Hospital, Chelsea, Mass.

The second phase of the red cell preservation program was begun as a field study, with the prime objective of evaluating the results of the basic studies in a general hospital. These applied studies have been carried out at the Chelsea Naval Hospital, by a team composed of Protein Foundation scientists and commissioned officers of the United States Navy. This study was handicapped for a time by the construction of new quarters, personnel turnover, and equipment problems, but despite these difficulties the group at Chelsea under Dr. [Achot] Khoubesserian and Commander [Mary T.] Sproul has succeeded in attaining the scale of operation originally planned for the project. This scale was determined mainly by the rate at which adequate clinical evaluation could be made of the cells which had been processed, frozen, and thawed at the laboratory. During the first six months of 1958, approximately 100 procedures were performed each month, a procedure being defined as the collection and freezing of fresh cells or the thawing and processing of long-term frozen cells. The frozen cells are currently being stored both at -80°C and at -120°C. At present the entire output of the unit is used to supplement the regular medical and surgical needs of the Chelsea Naval Hospital. The hematocrit of the thawed cells, ready for transfusion, averages

Above: *Blood Research Laboratory at the U. S. Naval Hospital, Chelsea, Mass.* Below: *Blood donor room at the laboratory.* Right: *Cohn fractionator used in processing blood at the laboratory.*

53%. This represents an over-all yield of 86% of the red cells originally taken from the donor months before; only 14% were lost during the process. This yield is actually larger than originally anticipated on the basis of data from experimental runs made at the Blood Characterization and Preservation Laboratory. It probably reflects the great care used and the somewhat longer time taken at Chelsea in thawing the cells and removing the glycerol. In contrast, however, there is a somewhat greater than anticipated loss of red cells in the 10-day storage period between deglycerolization and use; so that, over all, the yields at Chelsea and at the Blood Characterization and Preservation Laboratory are comparable.

The over-all recovery data suggest that the processing eliminates the more fragile and presumably older segment of the original randomly distributed

population of cells in the donor blood. This is corroborated by the fact that the 86% of the cells which withstand the rigors of processing show greater than normal survival in the recipient. We owe much to Captain Lewis L. Haynes, chief of surgery at the Chelsea Naval Hospital, and to Lieutenant Leo Oliner and Lt. Commander Theodore G. Drugas who have so ably administered the clinical side of the project, and without whose carefully collected data the project would have suffered seriously. The co-operation of this group has at all times been enthusiastic.

On August 1, 1958, the Chelsea group moved into handsome new laboratories provided by the Navy. This new facility, officially named the Blood Research Laboratory, was planned as a permanent laboratory for research and development on blood preservation, and has ample room for expansion should this be required. The unit contains complete arrangements for blood donors, a laboratory with space for two Cohn Fractionators (only one is being used at the present), and a large room equipped for low temperature storage of red cells; the remaining space is devoted to bacteriology and chemistry laboratories, work rooms for preparation of kits and reagents, an autoclave room, and office space. The new laboratory was dedicated in simple but impressive exercises attended by Dr. Frank B. Berry, Assistant Secretary of Defense (Health and Medical), by representatives of the Surgeons General of the three Armed Services, and by representatives of Government, industry, and universities. Protein Foundation has agreed tentatively to continue to hold the over-all scientific responsibility for the Blood Research Laboratory for another year, after which it is hoped that it can become a regular operating part of the Chelsea Naval Hospital.

Deaths

FENTON, Kevin Joseph, Lieutenant, MC, USNR, of Palo Alto, Calif.; assigned to U. S. Naval Radiological Defense Laboratory, San Francisco, Calif.; graduated in 1956 from Western Reserve University School of Medicine, Cleveland, Ohio; appointed a lieutenant in the United States Naval Reserve on 1 September 1956. Reported for active duty 8 July 1957; died 26 February 1959, aged 28, near Palo Alto, Calif., of subdural hemorrhage as a result of an automobile accident.

OKEL, James LeRoy, Lieutenant, MC, USN, of Montgomery, Ala.; student at the U. S. Naval School of Aviation Medicine, Pensacola, Fla.; graduated in 1957 from University of Alabama School of Medicine; appointed an ensign in the United States Naval Reserve on 5 April 1955, and commissioned a lieutenant in the United States Navy on 1 June 1957; reported for active duty 26 June 1957; died 4 March 1959, aged 26, near Bagdad, Fla., as a result of a military aircraft accident.

O'NIEL, Dolores Elizabeth Dwyer, First Lieutenant, AFRes (NC), of Galena, Ill.; assigned to 822d Medical Group, (SAC), Turner Air Force Base, Ga.; graduated in 1953 from St. Francis School of Nursing, Freeport, Ill.; appointed a second lieutenant in the United States Air Force Reserve 6 January 1956; reported for active duty 24 February 1956; died 6 March 1959; aged 25, at Walter Reed Army Hospital, Washington, D. C., of carcinoma.

Book Reviews

CLINICAL EPIDEMIOLOGY, by *John R. Paul,* M. D., Sc. D. 290 pages; illustrated. The University of Chicago Press, Chicago, Ill. 1959. Price $5.

Every epidemiologist must be a clinician. The author presents the view that, conversely, every clinician should know something of epidemiology and use this scientific tool in his practice. He should know how to go about determining "the *circumstances* under which a person or people get sick or remain sick. . . ." He need not be concerned with large numbers or populations because the principles of epidemiology apply equally to the smaller groups of people with whom the clinician deals. The small volume shows how this investigative approach can be used to advantage in noninfectious as well as infectious diseases. The author defines his terms clearly and simply, presents an interesting review of the history of epidemiology, then explains the principles and mechanics of clinical epidemiology. Statistical methods are given limited attention; emphasis is on etiologic factors, population information, the environment, and host susceptibility. As examples of the application of clinical epidemiology, excellent reviews are given of rheumatic fever, coronary occlusion, poliomyelitis, infectious and serum hepatitis and arthropod-borne virus infections. There are two appendices, the first explaining medical certification of cause of death, the second containing guides for planning serologic surveys. A comprehensive bibliography is also presented. This book should be of interest not only to clinicians and epidemiologists, but also to anyone interested in the patterns of disease.

—*CHARLES O. BRUCE, Col., MC, USA*

TEXTBOOK OF SURGERY. *Guy Blackburn,* M. B. E., M. Chir., F. R. C. S., and *Rex Lawrie,* M. D., M. S., F. R. C. S., M. R. C. P., (eds.) with a foreword by Sir *Russell Brock,* M. S., F. R. C. S., F. A. C. S. (hon.). 1122 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $16.75.

This text may be characterized as the British equivalent of "Christopher's Surgery." The 16 authors are members of the staff of Guy's Hospital and, therefore, present complementary views of their subjects. The 40 chapters cover the general field of surgery except ophthalmology and otorhinolarynology. Most of the material is orthodox and unremarkable. About one fifth of the volume is devoted to orthopedics; appropriate space is dedicated to each of the rest of the surgical specialties. It is by far the most current of the British texts; evidence of the commendable short time between pen and print is in the excellent chapter on "Heart and Major Blood Vessels." Because of the broad field the editors wished to cover the editorial decision was made to omit much pertinent material. For many readers this will detract from a well planned and laboriously assembled work because the remaining material is confusing in spots as a result of the lack of orienting detail. The book is well written. A happy innovation is

the inclusion of chapters on principles of anesthesia, radiology of the abdomen, radiotherapy, and on common surgical instruments. The index is adequate. There is no bibliography or reference to source material. Written "for the student preparing for final examinations," it will serve that purpose for the undergraduate.

—*DON S. WENGER, Col., USAF (MC)*

TREATMENT IN INTERNAL MEDICINE, by *Harold Thomas Hyman*, M. D. 609 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price $12.50.

This is an unusual publication. It is an encyclopedia of treatment which could well occupy several volumes. The fact that it is compressed into a single volume attests to the ability of the author to include only the essentials. At the same time it is not presented in outline form but in a very readable manner. The book is divided into ten sections starting with the infectious diseases and ending with disturbances in the specialty fields which frequently confront practitioners. Generally, each section starts with a list of drugs used along with dosage, commercial names and untoward side effects. The discussion then proceeds quickly to immediate care, continuing care and care of complications. Cross references are made to other portions of the book and references to the literature appear within the body of the material which does not interfere with the train of thought. The accompanying charts, lists and illustrations are appropriate and clear. The index is complete. To see this book is to purchase it. It should enjoy widespread usage because of its practicality and readability.

—*WILLIAM G. DUNNINGTON, Col., MC, USA*

DEFICIENCY DISEASE: Functional and Structural Changes in Mammalia Which Result From Endogenous Lack of One or More Essential Nutrients, by *Richard H. Follis, Jr.* 577 pages; illustrated. Charles C Thomas, Springfield, Ill., 1958. Price $14.75.

Dr. Follis' new book is unusual in several respects. First, it is oriented with the newer concept that nutritional disorders include disturbances ascribed to the many conditioning factors which "may produce general or local reductions or deficiencies of essential nutrients." Second, it is a book dealing with clinical and metabolic features of deficiency states but with a strong emphasis on pathologic changes. This, of course, reflects the author's well-known interest in pathology. As a matter of fact, it is a logical outgrowth of Follis' previous book, *The Pathology of Nutritional Disease*, written ten years ago. Third, it is unusually well documented. There is a bibliography of 1,535 items, and readers will welcome the full author and subject index. Attention should be called to a particularly valuable chapter on deficiency disease as a research method in biology and medicine. In addition, the author should be commended for including a discussion of such topics as dental caries, kwashiorkor, endemic goiter, celiac disease, and the hypokalemic syndrome. Perhaps in a future revision of the book it may be worth including disorders such as atherosclerosis which may be related to an imbalance or excess

of certain nutrients, rather than limit the topics to deficiencies only. This is a valuable book because of its emphasis on structural and functional changes resulting from the endogenous or exogenous lack of one or more nutrients. It is printed on good paper; the illustrations and type are excellent. It will prove to be a useful addition to nutritional literature.—*S. O. WAIFE, Lt. Cmdr., MC, USNR*

THE RECOVERY ROOM. A Symposium, by *John Adriani,* M.D., and *John B. Parmley,* M.D. American Lecture Series, Publication No. 340. A Monograph by American Lectures in Anesthesiology. 123 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1958. Price $4.25.

The recovery room must no longer be considered as only desirable but as a requisite in any surgical suite. This symposium is in question-and-answer form with a panel of many experts in the fields of anesthesiology, surgery, nursing and hospital administration, providing the responses. The book is well indexed and so organized that all pertinent phases of construction, staffing and operation are well represented. Charts and illustrations where appropriate are inserted for clarity. The format is more difficult to read than a narrative approach but the panel type of response makes this unavoidable. Anesthesiologists, who habitually control and operate recovery rooms, will find no new material here, but for those who contemplate construction of new operating suites, and for the newcomers, unaccustomed to completely appointed recovery rooms, much valuable basic information is herein available. The economics of operation and cost factors should be of interest to all civilian hospital administrators.—*JOHN F. KELLOGG, Jr., Lt. Col., MC, USA*

ANATOMY FOR SURGEONS. Volume 3. The Back and Limbs, by *W. Henry Hollinshead,* Ph.D. 901 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N.Y., 1958. Price $23.50.

This is an excellent book on regional anatomy of the back and limbs for the surgeon who desires a convenient and readable reference of the clinical aspects of the subject. The author presents a well organized anatomic compendium gleaned from his former lectures in surgical anatomy, and suggestions and observations the author has received in consultation with practicing surgeons of the Mayo Clinic and Mayo Foundation. The book is neither intended nor designed as a surgical anatomy with emphasis on surgical approach and detail, but has been written for the surgical resident and practicing surgeon. The diagrams, selected from the author's personal collection of line drawings and lecture illustrations, and published literature, are ample in number and well chosen for simplicity and clarity of interpretation. At the conclusion of each chapter is a very adequate list of references from the literature for the reader's convenience should he desire to pursue the subject matter in more detail. The book, nine chapters and index, includes considerations of anatomic tissues common to both the back and the limbs, a general survey of the development and general anatomy of each region, and detailed discussion of each regional anatomic entity.

—ALAN B. EAKER, Lt. Col., MC, USA

LIPPINCOTT'S HANDBOOK OF DENTAL PRACTICE, edited by *Louis I. Grossman*, D. D. S. 3d edition. 534 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price $14.

Whence cometh the name "handbook"? In this case, from the attempt to provide a handful of information on just about every phase of dentistry. Technical aspects are illustrated through sample technics. Didactic or background information receives a summation by an authority in the field. The list of contributors reads like an honor roll of dentistry. The chapter on "Hypnosis as Applied in Modern Dental Practice contains a sufficient number of case histories to give the reader a good trend of thought along the lines of indications and advantages of this useful adjunct. Technics for inducing the hypnotic state are not given, but it is one of the best prefaces to hypnosis in dentistry we have seen. Other sections are devoted to diagnosis and treatment and roentgenographic interpretation. A discussion of oral diagnosis provides an orderly, thorough appraisal, examination, and evaluation of the patient. It is an excellent exposition of how to use our increasing dental knowledge by directing treatment toward cause, as opposed to the older concept of empirical and systematic treatment. It cannot help but start the treatment plan in its most effective direction. There are a few things which lead to mixed feelings. Several misplacements of captions and illustrations occur. Some subjects inevitably suffer from overcondensation. In some cases, the brilliance of the contributor's original text does not shine through. This volume contains much sound, usable and diversified material here. For more detailed information the reading guides will be helpful.

—*JULES D. KARTMAN, Lt. Col., USAF (DC)*

THE ABO BLOOD GROUPS. Comprehensive Tables and Maps of World Distribution, by *A. E. Mourant*, M. A., D. Phil., D. M. (Oxford), M. R. C. P. (London), *Ada C. Kopéc*, D. ès Sc. (Geneve), and *Kazimiera Domaniewska-Sobczak*, M. A. (Wilno), A. L. A. 276 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $8.50.

The human erythrocyte is the most scientifically useful of all our tissues. It is instantly available in large amounts and it is sturdy enough to withstand manipulation and storage. In the field of metabolism the red cell serves as a model for the study of normal and abnormal metabolic processes. Because of its relatively short life span it is able to provide information concerning the aging process. It is afflicted by many hereditary diseases which make it a useful subject for the geneticist. The antigenic structure is also genetically determined and is so complex as to make a person's erythrocytes as individual as his fingerprints. Study of the blood-group antigens in various parts of the world has demonstrated that gene frequencies differ greatly among the human population groups. Therefore, the distribution of the human blood-group genes is of importance not only to the geneticist but to the anthropologist and ethnologist as well. Some years ago, Dr. Mourant undertook to compile all of the published work on the frequencies of the ten blood-group systems known at the present time. The ABO system, because of the massive amount of material available,

imposed a serious handicap on the project. So, it was decided first to complete the work on the lesser blood-group systems, and this resulted in the publication, in 1954, of *The Distribution of the Human Blood Groups*. The present volume, companion piece of the earlier work, is a tabulation of the data on the ABO system which had been published before the end of 1957. The book is a monumental accomplishment, containing approximately 4,000 entries, ranging from Abda in Morocco to the Zyrians of the USSR. In each instance the proportion of the blood groups O, A, B and AB of each population is tabulated. In addition, gene frequencies have been calculated and tests for homogeneity have been applied. A separate tabulation deals with the A_1, A_2, BO blood groups.

—*WILLIAM H. CROSBY, Lt. Col., MC, USA*

TUMORS OF THE LUNGS AND MEDIASTINUM, by *B. M. Fried,* M. D., F. C. C. P. 467 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $13.50.

This book is written in a clear, concise fashion reflecting the vast experience of the author and his collaborators in this field. A significant portion of the text is devoted to carcinoma of the lung. This disease is considered in an orderly manner as to etiology, diagnosis, prognosis, and treatment. Metastatic carcinoma is discussed both as a primary lesion in the lung metastasizing to distant organs and the lungs as a target for metastasis from primary cancers in virtually every part of the body. Prognosis and treatment are considered for each category. Tumors of the mediastinum are presented in the second part of the book, and this section includes the manifestations of primary and metastatic disease as well as such conditions as leukemia and Hodgkin's disease which are considered as general in nature. There are a number of excellent illustrations and diagnostic x-rays. The book is recommended to all doctors interested in diseases of the chest as an excellent reference.—*SHAKEEB EDE, Capt., MC, USN*

THIRST, Physiology of the Urge to Drink and Problems of Water Lack, by *A. V. Wolf,* Ph.D. 536 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1958. Price $12.50.

Of the two parts into which the book is divided, the first is an exhaustive review of the literature on thirst and closely related topics (893 references are given). Especially interesting are the discussions of thirst in hot environments and the effects of drinking sea water. As the points are developed throughout this part of the book, they are supported by tabulated data and curves. In addition, there is considerable use of mathematical formulations. All of this should make this a valuable source book. The second part contains accounts of persons who suffered prolonged water deprivation on the desert or while adrift at sea. This book should be of interest both to readers who have only a casual interest, and to readers who are actively concerned with problems relating to water balance. It should be of great value to persons concerned with military medicine.—*HENRY B. HALE, Ph.D.*

MANAGEMENT OF THE NEWBORN, 2d edition, by *Arthur Hawley Parmelee*, M. D., 368 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $8.50.

This book should be well received and of benefit to all persons interested in becoming familiar with the newly born child in all its characteristics and influencing factors. There is an excellent presentation of the characteristics and features of the child at birth and in the newborn period. This is an especially useful section to those persons in training status and should be available in newborn nurseries for reference and use by students, nurses, interns and residents as well as the general practitioner and young pediatricians. Other sections of the book feature comment on the premature infant, resuscitation of the newborn, birth injury and neonatal disease conditions, rooming-in and nursing and feeding care. Extensive elaboration is not given nor is it intended. All sections aid primarily in establishing a thought process and guides for the organized consideration of the child. Source material and bibliography references provide further expansion in the individual conditions mentioned. In my opinion this is a welcome revision to a good review, useful in gaining familiarity with the infant, and with the proper care and management so needed in this important period of pediatric supervision.—*EDWARD C. McKEON, Capt., MC, USA*

PROGRESS IN CLINICAL PSYCHOLOGY, edited by *Daniel Brower*, Ph. D., and *Lawrence E. Abt.*, Ph. D., volume III. 249 pages. Grune & Stratton, Inc., New York, N. Y., 1958. Price $7.75.

Some of the progress in clinical psychology during the past two years is recorded in this third volume of a series by 20 authors, including 3 psychiatrists. The book deals primarily with a symposium on the psychodiagnostic test battery and changing conceptions in psychotherapy but fails to accomplish the claim of the editors of a "systematic and critical look at the contemporary scene in clinical psychology." Seven chapters by a group of able clinicians offer a discussion on the psychodiagnostic test battery in terms of test selection, rationale, methodology, appraisal, application, and economic factors. This part of the book is very practical. The nine chapters which deal with the changing conceptions in psychotherapy include coverage of group, play, and rehabilitation therapies, pharmacologic aids, psychoanalysis, and experimental procedures. Any book which attempts to survey current trends in a specialized field is bound to result in a hazardous venture because of the necessity to select topics and contributors which results from the exercise of value-judgments. Because of its fragmentation, this volume is only partially a survey and review of clinical psychology. Those whose concern is with clinical psychology as a science will find very little in this book about a better integration of theories, practices, and trends. However, in spite of obvious faults, this book does offer meaningful surveys of specialized topics in clinical psychology to students and colleagues of the mental health team. Clinicians will welcome the practical help offered in the practice of psychodiagnostic testing.—*FRANK KILLIAN, Jr., Lt. Col., USAF (MSC)*

CLINICAL HAEMATOLOGY IN MEDICAL PRACTICE, by *G. C. de Gruchy*, M. D. (Melb.), F. R. A. C. P., M. R. C. P., (Lond.), M. C. P. A., with a Foreword by *J. V. Dacie*. 620 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $10.

Each year hematology (and the rest of the world) becomes more complicated. The new diseases, new factors, new drugs, new complications pile one upon the next in such profusion as to make specialism within the specialty seem reasonable, and the books about hematology seem ever narrower in scope, or else more massive. This book runs counter to the trend. Although it professes to be a book of clinical hematology, it is no mere précis of diagnostic tests and therapeutic schedules. It is, rather, a sound, well-ordered and well-written account of the contemporary status of hematology. The physiology of the organ system is set forth; and against such a background are described the many diseases of red cells, white cells, marrow and lymphatic tissues. Emphasis is placed upon what the physician must do. Everything is handled with gratifying clarity and conciseness. Remember the time Voltaire wrote to a friend, "I am making this a long letter because I haven't time to write a short one."? Well, Dr. de Gruchy has taken the time.—*WILLIAM H. CROSBY, Lt. Col., MC, USA*

TEMPORAL LOBE EPILEPSY. A Colloquium Sponsored by the National Institute of Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Maryland. In Co-operation with the International League against Epilepsy. Edited by *Maitland Baldwin*, M. D. and *Pearce Bailey*, Ph. D., M. D. Coeditors: *Cosimo Ajmone-Marsan*, *Igor Klatzo*, and *Donald Tower*. 581 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $15.50.

The co-ordinated efforts of 56 contributors are reflected in the various papers presented in this book. I had the good fortune to attend most of the meetings and found them to be among the best in my experience. This book is as broad in scope as is the problem of temporal lobe epilepsy. The problem is first considered from the standpoint of electroencephalography and neurophysiology with highlights such as the identification of prominent potential changes in hippocampal seizures in animals which are attributable to dendritic excitation, further elucidation of the graded response mechanisms of neurons, and discussion of the gradual anterior progression of spike foci in children, to mention a few. In the second part pathologic aspects of temporal lobe epilepsy are discussed, and there is an eye opener by Webb Haymaker in which he examines many cases of temporal lobe pathology and finds no seizures in the histories. There follows an excellent section on the neurochemistry basis of seizure by D. B. Tower. The last sections concern surgical series in temporal lobe epilepsy and clinical aftermaths of temporal lobectomy. H. Kluver discusses the temporal lobe syndrome and M. A. Falconer's presentation of his series of temporal lobe surgery reflects meticulous masterful work and valid evaluation. This excellent book is strongly recommended reading for all students of neurology, neurosurgery and psychiatry.—*THEODORE M. BADGLEY, Maj., MC, USA*

THE AMPHETAMINES, Their Actions and Uses, by *Chauncey D. Leake*, Ph. D. American Lecture Series, Publication No. 338. A Monograph in The Bannerstone Division of American Lectures in Pharmacology. 167 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.50.

Professor Leake has had the rare opportunity of observing at first hand the development of the amphetamines from the beginning of their early pharmacological trials up to their present wide use. In this small volume he has written a concise summary of our present knowledge of both isomers of amphetamine, of methyl amphetamine and of a few closely related compounds. The book is not intended primarily for the pharmacologist but for the practicing physician and for the lawyer, sociologist, and psychologist. Accordingly, less than one third of the space is devoted to pharmacological aspects, and the chapters of the therapeutic uses and on the sociologic aspects each comprise most of the remainder. There are almost 300 well-chosen references. Because the book is concerned entirely with the amphetamines, the chapter on therapeutic uses does not attempt to give a balanced view. Perhaps of greater value is the chapter on sociologic aspects with discussions of addiction, use in sports, "pep pills," and legal restrictions on amphetamines.

—*PAUL K. SMITH, Col., USAFR*

CARDIAC ARREST AND RESUSCITATION, by *Hugh E. Stephenson, Jr.*, M. D., 378 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., 1958. Price $12.

This classic contribution is a great tribute to the author who has carried the stimulus which has resulted in the analysis in over 1,700 cases in which cardiac arrest and resuscitation has been the major issue. He began this work during his residency and has continued it as he has become a professor of surgery. The book is a comprehensive, clear, and refreshing analysis of all phases of this problem with emphasis placed upon the common, simple problems of prevention. Encouragement is given to those who have the strength to defer surgical operation even though the patient has arrived at the operating room, if atypical symptoms and findings are present or develop early during the anesthesia which indicate an added probability of cardiac arrest. The cardiac arrest registry is brought to proper light in this outstanding book. Considerable emphasis is placed upon the mechanism of ventricular fibrillation and the great strides which have been made in management of this problem are clearly presented. A portion of the book, which is of more than passing interest to all surgeons, deals with the medicolegal aspects of cardiac arrest and resuscitation. It is ably presented by a contributing author, Elwyn L. Cady, Jr. As a reference, this volume is recommended to all engaged in the practice of surgery and a must for all of those who devote an appreciable interest to the area of thoracic and cardiac surgery.—*JAMES H. FORSEE, Brig. Gen., MC, USA*

New Books

THE SYMPTOM AS COMMUNICATION IN SCHIZOPHRENIA, edited by Lt. Colonel *Kenneth L. Artiss*, MC, USA. 233 pages. Grune & Stratton, Inc., New York, N. Y., 1959. Price $5.75.

ATOMIC MEDICINE, edited by *Charles F. Behrens*, M. D., F. A. C. R., 3d edition; 705 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., 1959. Price $15.

DISEASES OF THE COLON AND ANORECTUM, Volumes I and II, edited by *Robert Turell*, M. D. 1,238 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $35 for set of two volumes.

DENTAL-MEDICAL EMERGENCIES AND COMPLICATIONS, by *Ira Jay Berlove*, D. D. S., M. D., F. A. C. D., F. I. C. S. 380 pages. The Year Book Publishers, Inc., Chicago, Ill., 1959. Price $7.50.

THERAPEUTIC RADIOLOGY, Rationale, Technique, Results. By *William T. Moss*, M. D. 403 pages; illustrated. C. V. Mosby Company, St. Louis, Mo., 1959. Price $12.50.

CANCER, Diagnosis and Treatment, edited by *John B. Field*, M. D., Ph. D., with 28 contributors. 796 pages; illustrated. Little, Brown & Co., Boston, Mass., 1959. Price $18.50.

PSYCHOLOGY OF PERSONALITY, edited by *J. J. McCary*, Ph. D., with six contributors. 383 pages. Grove Press Inc., New York, N. Y., 1959. Price $1.95.

BLEEDING ESOPHAGEAL VARICES, by *Hirsch Robert Liebowitz*, B. S., M. D., with a Section on Treatment in collaboration with *Louis M. Rousselot*, M. D., M. S., Med. Sc. D. F. A. C. S. 986 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $24.50.

MODERN TRENDS IN DISEASES OF THE VERTEBRAL COLUMN, edited by *Reginald Nassim*, B. M., F. R. C. P., and *H. Jackson Burrows*, M. D., F. R. C. S., F. R. A. C. S., with 15 contributors. 303 pages; illustrated. Paul B. Hoeber, Inc., New York, N. Y., 1959. Price $15.

THE TREATMENT OF DIABETES MELLITUS, edited by *Elliot P. Joslin*, A. M., M. D., Sc. D.; *Howard F. Root*, M. D., H. H. D.; *Pricilla White*, M. D., Sc. D.; and *Alexander Marble*, A. M., M. D. 10th Ed., revised. 798 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1959. Price $16.50.

DISEASES OF METABOLISM, Detailed Methods of Diagnosis and Treatment, edited by *Garfield G. Duncan*, M. D., with *22 contributors*. 4th edition. 1,104 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $18.50.

TEXTBOOK OF MICROBIOLOGY, by *William Burrows*, Ph. D., with the collaboration of *Richard Janvier Porter*, Ph. D., and *James William Moulder*, Ph. D. 17th edition. 954 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $14.

TEXTBOOK OF SURGERY, edited by *H. Fred Moseley*, M. A., D. M., M. Ch. (Oxon), F. A. C. S., (Eng.), F. R. C. S. (C). 3d edition. 1,336 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., 1959. Price $17.

GYNECOLOGY AND GYNECOLOGIC NURSING, by *Norma F. Miller*, M. D., and *Hazel Avery*, A. B., R. N., with a chapter on the Gynecology Operating Room by *Mildred Quackenbush*, B. S. N. Ed., R. N., and a chapter on The Psychosomatic Approach to Gynecology, by *Sprague Gardiner*, M. D. 4th edition. 501 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $5.50.

GARNEY'S DOSAGE AND SOLUTIONS, A Textbook for Nurses, revised by *Hulda L. Gunther*, B. S., R. N. 5th edition. 209 pages. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $2.50.

DISEASES OF LABORATORY PRIMATES, by *Theodore C. Ruch*, Ph. D., with the Editorial Assistance of *Maryeva W. Terry*, B. A. 600 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $7.50.

THE ANATOMY OF THE NERVOUS SYSTEM, Its Development and Function, by *Stephen Walter Ranson*, M. D., Ph. D., revised by *Sam Lillard Clark*, M. D., Ph. D. 10th edition. 622 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $9.50.

THE YEAR BOOK OF THE EAR, NOSE & THROAT, (1958-1959 Year Book Series), edited by *John R. Lindsay*, M. D., with a section on Maxillofacial Surgery, edited by *Dean M. Lierle*, M. D., and *William C. Huffman*, M. D. 395 pages; illustrated. The Year Book Publishers, Chicago, Ill., 1959. Price $7.50.

THE YEAR BOOK OF OPTHALMOLOGY (1958-1959 Year Book Series), edited by *Derrick Vail*, B. A., M. D., D. Oph. (Oxon), F. A. C. S., F. R. C. S. (Hon.) 407 pages; illustrated. The Year Book Publishers Incorporated, Chicago, Ill., 1959. Price $7.50.

SURGERY OF THE PROSTATE, by *Henry M. Weirauch*, M. D., F. A. C. S. 535 pages; illustrated by *Halcyon Harris Cowles* and *Ralph Sweet*. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $15.

SURGERY OF THE STOMACH AND DUODENUM, by *Claude E. Welch*, M. D., D. Sc. (Hon). 3d edition, revised. 405 pages; illustrated. Year Book Publishers Inc., Chicago, Ill., 1959. Price $9.75.

EXPERIMENTATION IN MAN, by *Henry K. Beecher*, M. D. 80 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $3.50.

INBORN ERRORS OF METABOLISM, by *David Yi-Yung Hsia*, M. D. 358 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1959. Price $9.50.

GEOGRAPHIC OPTHALMOLOGY, edited by *William John Holmes*, M. D. 293 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $8.50.

AN INTRODUCTION TO PHYSICAL EDUCATION, by *Eugene W. Nixon* and *Frederick W. Cozens*. 5th edition, revised by *John E. Nixon* and *Florence Stumpf Frederickson*. 287 pages. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $4.25.

THE PSYCHIATRIC AIDE, A Textbook of Patient Care, by *Alice M. Robinson*, R. N., M. S. 2d edition. 200 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1959. Price $3.50.

OCCLUSAL EQUILIBRATION AND TEMPOROMANDIBULAR JOINT DYSFUNCTION, by *Nathan Allen Shore*, D. D. S. 323 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1959. Price $12.50.

THE PLASMA PROTEINS, Clinical Significance, by *Paul G. Weil*, B. A., M. D. C. M., M. Sc., Ph. D. 133 pages. J. B. Lippincott Company, Philadelphia, Pa., 1959. Price $3.50.

THE CLINICAL EXAMINATION OF PATIENTS WITH ORGANIC CEREBRAL DISEASE, by *R. Klein*, M. D., and *W. Mayer-Gross*, M. D., F. R. C. P. 96 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $3.50.

PERSONALITY, Development and Assessment, by *Charles M. Harsh* and *H. G. Schrickel*, 2d edition. 536 pages. The Ronald Press Company, New York, N. Y., 1959. Price $6.75.

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